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ABSTRACT

This teacher's guide contains multidisciplinary activities written by teachers and principals in Genesee County, Michigan, in a four-day workshop sponsored by Project CHANGE. Activities contained in this publication range from elementary through high school levels, with the appropriate teaching level being indicated for each activity. Most of the activities are presented on a single page. The objective of the activity, materials needed (if any), description (of what the students should do; cautions to the teacher), and related activities (if any) are provided within this space limitation. Some activities designed for high school students contain more detail in the form of directions, questions to be answered, or simple identification keys. (PES)

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PROJECT CHANGE

Genesee Intermediate School District
2413 West Maple Avenue
Flint, Michigan 48507

July, 1973

INTRODUCTION

Among the precepts that educators accept and expound are "learning by doing...firsthand experience...direct contact...integrated learning." There is a ready-made, free, superbly equipped educational facility available to all where such things are possible. It's called THE OUTDOORS.

Everyone is becoming more aware of our SPACESHIP EARTH and its limited resources. Curriculum efforts in this area have been called different things: nature study, outdoor education, conservation, environmental education. Let us not worry about labels and definitions; let's do something!

The General School Laws of the State of Michigan require that the curriculum in all the public schools shall include instruction in "humane treatment and protection of animals and birds, economy of nature."

Does your curriculum include objectives to comply with this law? Are you having a difficult time meeting your objectives?

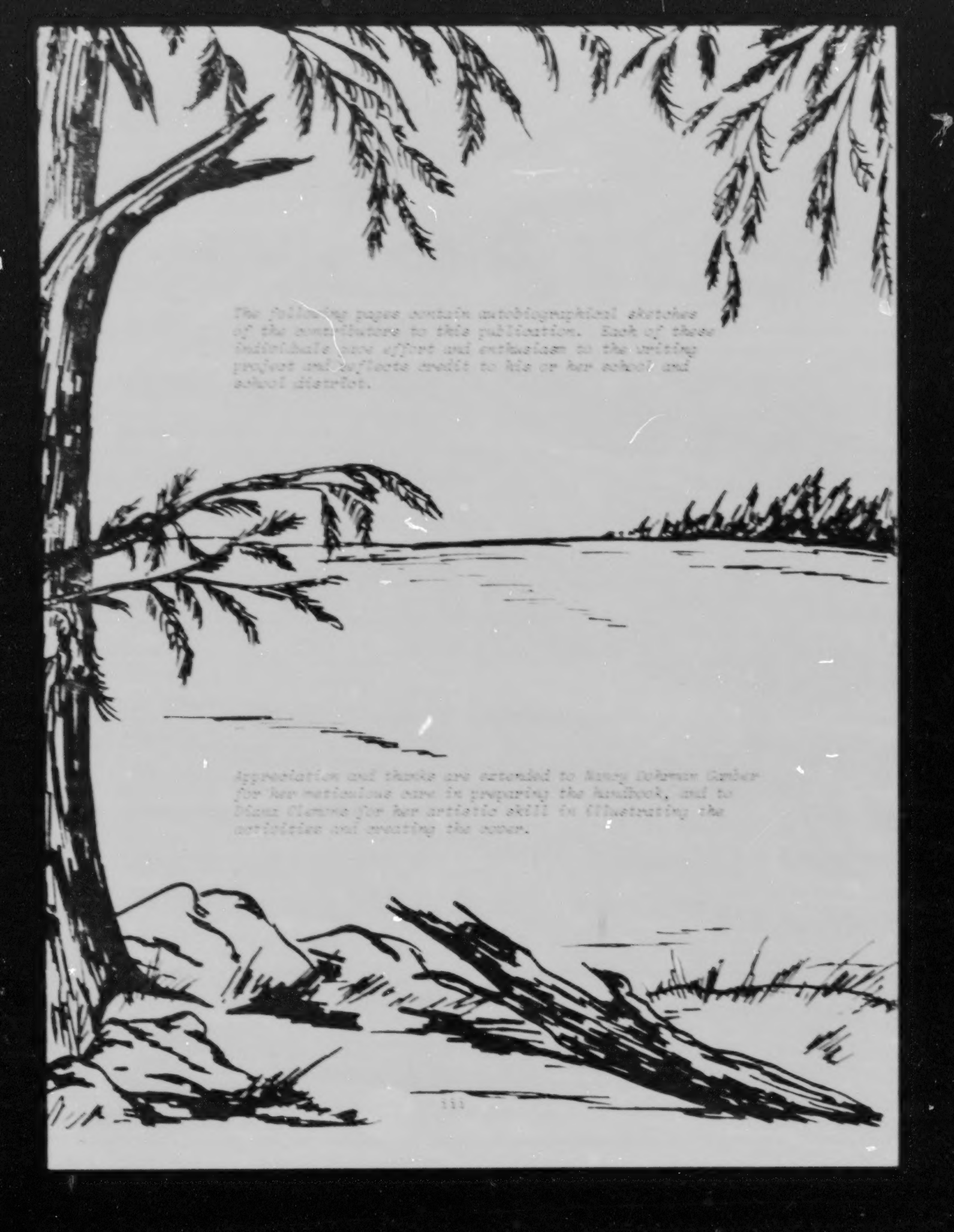
This collection of suggestions for outdoor learning will get you started. Modify them to suit your situation and needs; extend and expand them; design new activities.

The outdoors has many advantages over a confined classroom:

- natural setting has greater diversity of arrangements, space and materials for instruction than a classroom could possibly have,
- every school has access to the great outdoors,
- outdoor learning transcends subject categories; it applies to the total curriculum, and
- county and private outdoor facilities are conveniently distributed.

Heed the motto of a well-known national curriculum program...

"The classroom is outside; let's get into it."



The following pages contain autobiographical sketches of the contributors to this publication. Each of these individuals gave effort and enthusiasm to the writing project and reflects credit to his or her school and school district.

Appreciation and thanks are extended to Nancy Debrauer Ginter for her meticulous care in preparing the handbook, and to Diana Clemens for her artistic skill in illustrating the activities and creating the cover.

Norah Thomas - Flushing School District

I was born in Tunbridge Wells, Kent, England. My mother named me Norah, but I have always thought she should have given me my sister's name, Sylvia, as I am the "child of the woods". When I was two years old, my parents came to Genesee County where I have lived ever since. After graduating from Flushing High School, I attended Genesee County Normal School in Flint. After one year of training I was hired to teach grades one through seven at the old Kent School a mile west of Flushing. After that year, I did not teach again for twenty years. In the meantime, I raised a family of six. As life got dull with the children gone, I decided to work for a B.S. degree. So I did substitute teaching and struggled through classes evenings, Saturdays and every summer until this goal was accomplished. I have taught the past fifteen years in the Flushing Schools and really enjoy my work.

Terry R. Sproule - Carman School District

Bachelor of Music Education - Central Michigan University; Master's in Curriculum and Instruction Technology - Michigan State University. My educational experience has been in teaching instructional and vocal music for 8 years; assistant building principal for 1 year and teaching environmental science for 2 years, all at Mandeville Junior High School.

Olan Mishler - Lakeville School District

B.S. and M.A. from Michigan State University. I have been at Lakeville since July of 1956, five years as a teacher of vocational agriculture, general science, biology and farm shop; three years as a counselor; the last nine years as an administrator. My agricultural background has been influential in the development of my attitude toward environmental education. I love and enjoy the outdoors and am deeply concerned over the destruction of so many of our natural areas. I believe that education concerning resources is necessary if we are going to save anything of real value for future generations. It seems that the best way to educate the public is through the young people.

LeRoy McDowell - Lakeville School District

B.S. - Western Michigan University. My interests are photography and outdoor activities, camping and backpacking especially. Through camping, I became aware of the importance of outdoor education as a tool for science classes. I teach living science and the earth space sciences at Lakeville Middle School.

Marjorie Vernon - Atherton School District

B.A. - The University of Michigan. Graduate work from Northern and Eastern Michigan Universities. I am teaching a semester class in conservation, second year biology and introductory physical science at Atherton High School. This is my sixth year. The school district is appointing a committee to develop 20 acres for outdoor education and recreation. I am involved in this.

Arnold L. Griffin - Carman School District

A.A. - Flint Junior College; B.A. - The University of Michigan; M.A. - Eastern Michigan University; Education Specialist, Michigan State University. Total of 15 years in education; 2 years in the classroom, 7 years as community school director in city of Flint, 6 years as elementary principal in Carman School District. I enjoy travel, family camping and snowmobile riding in the forest.

Dan Gajewski - Kearsley School District

I have a B.S. degree from Southern Illinois University and M.A. from Michigan State University. I taught general science for 7 years and earth science for 1 year at Daly Junior High. I'm presently teaching earth science at Kearsley's new Armstrong Middle School. Earth science activities have involved me with the Michigan Earth Science Teachers Association and I am now serving as vice-president of that organization. John Krohn and I developed a mini-outdoor lab at Daly Junior High and are now developing 120 acres at Armstrong. This work has been rewarding to me. Teaching science has become much more meaningful to me and my students since we have discovered that our classroom is the outdoor laboratory.

John Krohn - Kearsley School District

B.S. - Indiana State University; M.A. - Michigan State University; A.Y.I. - University of Northern Iowa. I helped to develop the outdoor laboratory with Dan Gajewski at Daly Junior High School where I taught for 7 years. Provided leadership in the development of outdoor learning areas in Cedar Falls and Marshalltown, Iowa. Currently teaching earth science and mathematics at Armstrong Middle School and developing, with Dan, the school site as an outdoor learning environment. Working with students on the school site has provided many exciting experiences. Perhaps, this is the most enjoyable year I have had as a teacher.

Adrienne Shieck - Mt. Morris School District

B.A. degree - Flint U. of M. Working on master's degree at Eastern Michigan University. Teach biology, physiology at Elisabeth Ann Johnson High School. Currently at work on site development at the high school. Cooperate with others in the county to plan environmental activities. Interest stems from active participation with senior scouts in outdoor activities.

Edward Pokornowski - Linden School District

I was born in Chicago and lived there for the first 19 years of my life. I finished high school and served in the Air Force during World War II. I attended Junior College in Chicago, then continued at Michigan State to receive my B.A., M.A. and Educational Specialist degrees. My teaching experience was at North School, Lansing for 3 years; at Franklin School, Birmingham for 9 years. My administrative experience was as elementary supervisor, Tri-County Area, Howard City for 7 years; now elementary principal at Linden Elementary School for 3 years. Camping, reading and sports interest me.

Fred Kienitz - Carman School District

B.A. - The University of Michigan; M.A. - The University of Michigan; elementary principal at Hoover. I have been an elementary science coordinator and elementary school teacher. I was born and raised in Michigan. My special interests are golf, fishing and travel.

Sandra Jacob - Beecher School District

B.S. - Biology, Michigan State University; B.S. - Health Education, Michigan State University. I've spent the past year teaching environmental sciences at Beecher High School: basic ecology, wildlife management, environmental problems and urban ecology. This offers a pretty wide scope and keeps interest high.

William Hajec - Fenton School District

B.S. from Ball State University in biology. I teach biology at Fenton High School. I am working on a master's program in biology from Eastern Michigan University, with specialization in environment. My hobbies include all sports.

Mrs. Marie Shepard - Swartz Creek School District

Live on a 100 acre farm; 18 years of teaching later elementary or 7th grade science. Taught in one-room schools, also at New Lothrop, old Dye School; last 7 years at Swartz Creek. Graduated from Eastern Michigan University. (B.S.), Master's Degree in Resource Development from Michigan State University and have 15 hours beyond M.S., avocation is Soil and Water Conservation for the past 15 years.

Jean Outman - Carman School District

I am teaching third and fourth grades. I taught ten years in a one-room rural school. I am surprised by how many of the things we are trying to do now we also did back in the good old days. All activities were done by the teacher, two or three parents and the students. No money was available. We had sand boxes for the younger students; we planted shrubs for the birds; made our own bird bath, built the form and mixed the cement; made bird feeders; made and planted rock gardens; built rock steps up from the road. So all of what we are doing now is not new.

Jim Mindorff - Carman School District

B.A. - Elementary Education, Northern Michigan University; M.A. - Educational Administration, Northern Michigan University. I was raised in the Upper Peninsula of Michigan where I became actively interested in hunting, fishing and the outdoors. I teach 5th grade at Rankin Elementary School.

Jill Pirrotta - Carman School District

Graduated from Flint U. of M.; M.A. from The University of Michigan. First grade teacher for ten years in the Carman School District. Presently teaching AAAS Science to all first grades at Dye Elementary. We camp in state parks with our children to enjoy the forests and lakes of Michigan.

Sue Dacko - Linden School District

I'm a third year teacher at Linden Elementary School. I enjoy the outdoors and like to convey my appreciation of the environment to others.

Vickie Weiss - Grand Blanc School District

I graduated from Flint College of The University of Michigan and am currently working on a master's degree from Oakland University. I have taught in Grand Blanc for nine years. I'm a 3-4-5 classroom teacher at Indian Hill Elementary School. I enjoy being outdoors with kids, camping or developing nature projects, such as outdoor education with a 4-H Club, a small nature area near the school, and a spring camping trip.

Gré Obrecht - Carman School District

Lake Fenton is my front yard and that is the best part. I thought to be an anthropologist so I pursued this path at The University of Michigan with a short junket at the University of New Mexico. Three summers at "Bug Camp" (U. of M. Biological Station) were a sheer delight. Following a M.A. plus from The University of Michigan I found myself in the laboratory as an instructor, a mighty sobering experience! After working with young adults for some moons, I found myself knocking at the door of public school teaching, so here I am at Mandeville Junior High living the joys and frustrations so familiar to teachers. Outdoor education has always been a part of my life and inflicted upon everyone I come in contact with.

Tom McElroy - Lakeville School District

8th grade - physical sciences teacher, Lakeville Middle School.
B.S. - Western Michigan University. Enrolled in a master's program at Eastern Michigan University in middle school education. My teaching experiences at Lakeville during the past 2 years have beautifully complemented my college work. With subject concentration in geology and geography the "in class" and "outdoor" laboratory work has been most enjoyable. It has been great to work on and in the outdoor area with students; most valuable has been the trust enjoyed by me and the students. Without this trust I could not deserve nor receive success. I enjoy all outdoor activities. Camping, fishing and canoeing are my favorites.

Vernon DuPraw - Carman School District

I did my undergraduate work at The University of Michigan. I received my master's degree at The University of Michigan in elementary school administration. I'm now twenty-two hours toward a specialist degree in school administration. At the present time, I am assistant principal at Dye Elementary in the Carman School District. We're developing a nature area behind the school. This is my eighth year in education, five years as a teacher and three as an administrator.

Gregory Gillam - Flushing School District

B.S. - Central Michigan University. Amateur taxidermist and general biology teacher at Flushing High School for two years. I believe that an understanding and love of nature comes from the knowledge of and seeing the beauty of the environment. If a child, young or old, can see and touch nature, they will learn to love and respect it and most of all, protect it.

OBJECTIVE:

The student will gather objects from nature that can be removed without permanent damage or loss.

MATERIALS:

coffee can or paper bag
a teacher list of 20 to 30 items found in an outdoor setting

DESCRIPTION:

Preplanning: teacher and students will go into the nature area and make a list of the items that can be removed from the area.

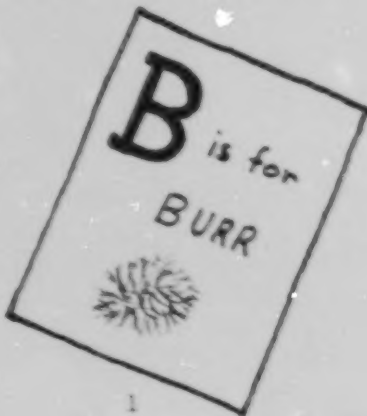
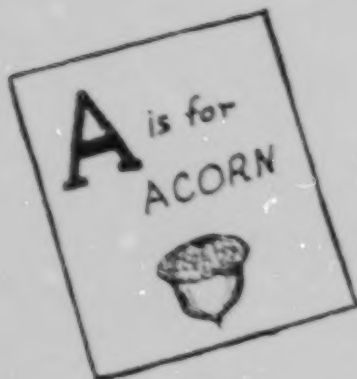
Each student is to take the "collecting" equipment and go into the area and gather the items mentioned. A specific amount of time should be set for this.

Return to the classroom or some other specific location where you can discuss with the students what has been found and who has collected the most items.

Variations:

1. In some cases, you might like to put a point value on different items depending upon how scarce or plentiful it is in the nature area. The student with the greatest number of points would be the winner, or recognize the ten children with the most points.
2. Try an ABC scavenger hunt. Students are to get an object to represent as many letters as possible.

a = acorn, b = burr, etc.



TITLE: Look What I Found!!

LEVEL: Elementary

OBJECTIVE:

Students will develop observation skills, learn to use reference skills and learn to record data.

DESCRIPTION:

Take a nature hike in the school's nature area. Each child will bring back one thing - leaf, nut, mushroom, weed, etc. Bring back and have them write down everything they can about that object. Do research and compile some facts. Afterwards, compile what the children have written in a "guide" for the nature area.

RELATED ACTIVITIES:

Art: draw or paint "What I See"

Language Arts: creative writing



TITLE: Dandelion Day

LEVEL: Elementary

OBJECTIVE:

The student will use the spring dandelion crop as a basis for total curriculum activity.

MATERIALS:

a field of dandelions

DESCRIPTION:

Did you ever have a Dandelion Day? It can happen some afternoon when you go outside and see that enormous field on the school property covered by dandelions--absolutely covered!!

Follow the children and a million things will happen. One game devised by children is pulling the dandelions up by their roots. A natural kind of competition occurs - WHO HAS THE LONGEST ROOT?

Also, children know all those little sayings and games used when putting a dandelion under their chins.

Back in the classroom ask the children if they could think of some purposeful use for all of the dandelions.

Students will be off and running; some--the inventors--will create. One girl painted a picture using "squished" dandelions. Another thought there should be a way of using them to paint the yellow strip down the highway. A boy mentioned that his grandfather made dandelion wine and by the end of the week he had two bottles of it--one finished and one fermenting.

RELATED ACTIVITIES:

Creative Language Experiences: write a poem story about dandelions or feelings about them; sketches, paintings; "yellow" things

Science: examine parts of a dandelion under lens or microscope; determine how dandelions (seeds) are carried; investigate methods of removing dandelions and consequences; turn a dandelion from yellow to blue with food coloring in water

Research: finding recipes using dandelions in reference books like Stalking the Wild Asparagus

Mathematics: estimate how many dandelions in a given area based on a sample area; compare lengths of roots

TITLE: Temperature Differences in Sun and Shade

LEVEL: Elementary

OBJECTIVE:

The students will measure temperatures in various locations and discuss the differences found.

MATERIALS:

five thermometers

DESCRIPTION:

Show the students how to read their thermometers.

Place each thermometer on a sunny windowsill, shady windowsill, building in the sun, building in the shade, and in the snow. Temperatures are then read and compared.

Students observe that the temperature on a windowsill will be higher than the temperature away from the building. Sunny temperatures will be higher than shady temperatures. The temperature beneath the snow is higher than the temperature on top of the snow.

The students learn why people and animals seek certain areas at certain times of the year and why snow is important as a ground cover in winter to protect plants and animals.



TITLE: Common Properties of Plants

LEVEL: Elementary

OBJECTIVE:

The students will learn the common, basic parts and functions of members of the plant kingdom.

MATERIALS:

examples or pictures of many plants (include flowers, bushes, trees, a flower bulb or fern)
microscope
film on tapping maple trees

DESCRIPTION:

Observe each plant and identify similarities; e.g., all plants have roots which extend over an area to secure food for the plant, they also have leaves. Observe veins and stoma under microscope to observe leaf construction. Compare leaf veins with human veins, stoma to skin pores to conclude function of a leaf. Plants have stems. Cut some weed stems to demonstrate sap in the stem. If possible, show film on tapping maple trees to show that the stem, even if it is called a trunk, carries the life fluids of the plant. Plants have methods of reproduction. Show bulb (or onion), nut, flower, seeds of different plants. Observe that even though the seed may be in a fruit, flower, cone, or bulb, it produces a new plant.

Hopefully, children who know the function of the stem of a tree will refrain from peeling bark from a tree.

TITLE: Life Cycle of Animals

LEVEL: Elementary

OBJECTIVE:

Note physical changes of animals as they progress through their life cycle. These occur in similar sequence, though not necessarily in the same time span or in the same way.

MATERIALS:

white mice, gerbils or hamsters
monarch butterfly caterpillar
tadpole
movies to demonstrate the life cycle of a butterfly

DESCRIPTION:

Review the needs of animals (food, water, shelter) and prepare the proper habitat and food for each animal. Observe and record the growth and change of the animals. Note: mammals change very little except in size. Insects and frogs change in body shape and form as the life cycle progresses. When the animal matures, it will reproduce its own kind which will undergo the same life cycle stages as the parent. Young are produced in different ways -- mammals will produce living young, insects will attach eggs to a food supply, frogs will lay eggs on water.

RELATED ACTIVITIES:

This should be accompanied by constant lessons of proper care for and respect for all creatures and responsibility for tending animals under our care. Follow up with a set of pictures showing the life cycle of an animal and have the children put them in proper sequence; e.g., mother cat nursing tiny kitten, older kitten, old cat.

TITLE: Blindfold Taste Test

LEVEL: Elementary

OBJECTIVE:

The students will learn that the sense of taste is affected by sight.

MATERIALS:

peeled grapes
cooked spaghetti noodles
mashed potatoes

whipped, crustless bread
other foods with little or no smell
blindfold

DESCRIPTION:

Blindfold a student and have him pick up food in his fingers and eat it, telling you what he thinks it is. If you have a student who can psychologically "take it", you might suggest something else; i.e., spaghetti might be "worms". Have the students note that taste can be affected by the loss of vision.



TITLE: The Five Senses and Their Functions

LEVEL: Elementary

OBJECTIVE:

The students will define the five senses and their uses.

MATERIALS:

popcorn popper
popcorn
portable screen to shield the popper

DESCRIPTION:

Begin popping the corn while the children are doing something else, or preferably while they are out of the room. When the children comment that popcorn is popping ask them how they know. Usually the first reply will be, "I smelled it". The next answer might be, "I heard it". Identify these senses. Then discuss how it sounds and smells. Pass out an unpopped seed to each child with his popcorn. Discuss how each looks and feels, popped and unpopped. Identify sense of touch and sight. Finally, discuss how it tastes, define taste.

Review the five ways we knew about the popcorn; identify the organ that controls each sense, let the children speculate what the deprivation of a sense would be like. This should be preceded by the children listening, taking a blind walk, or a blindfold taste test which would actually demonstrate what deprivation of a sense would be like.

TITLE: Seasonal Changes

LEVEL: Elementary

OBJECTIVE:

The student will observe a demonstration of the earth's rotation and revolution about the sun.

MATERIALS:

globe (which rotates on an axis)
flashlight

DESCRIPTION:

Define "revolve" and "rotate". The earth rotates on its axis which revolves around the sun. Use a flashlight for the sun. Have a child hold the "sun". Observe light shadows (night and day). Observe that the axis of the earth remains the same even though the earth is in a different position in relationship to the sun. Observe that when one hemisphere is tilted toward the sun, the other one will be tilted away from the sun. When the earth revolves one hemisphere will get more light than the other--thus more heat.

In two positions the hemispheres will be approximately equidistant from the sun. They will get about the same amount of light. These differences in earth tilt cause seasons; more light means longer days and more heat in the summer. When the northern hemisphere has summer, the southern hemisphere will have winter and vice-versa. Times when the day and night are the same length are intermediate seasons which are called spring and fall.

The first day of winter will be when the day is the shortest and the night is longest. The first day of summer will be the longest day and shortest night of the year. The first days of spring and fall will have equal day and night.

TITLE: Snow as a Measure of Pollution

LEVEL: Elementary

OBJECTIVE:

Determine amount of pollution in a given sample. Predict source of pollution.

MATERIALS:

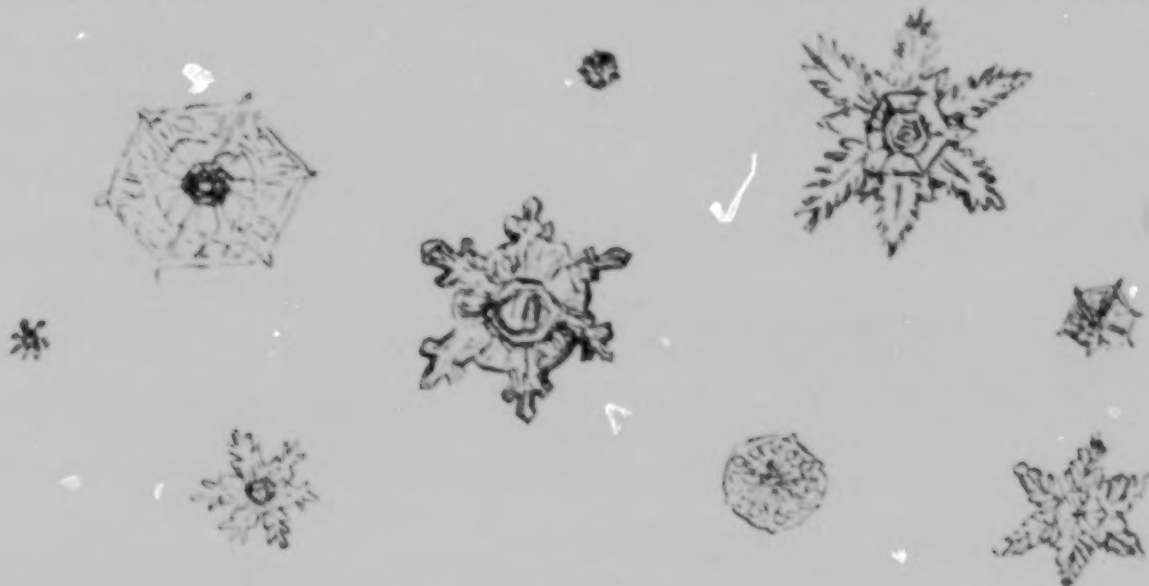
coffee cans
cleansing tissue
microscope
magnifying glass
glass containers

DESCRIPTION:

What's in snow? Have you ever eaten snow? Get samples of snow from different areas, close to buildings, away from buildings, open areas, near road. Label jars of snow from the various areas. Let snow melt. Pour through cleansing tissue, note sediment. Compare sediment or pollution of the samples from the different areas.

Would you want to eat this snow? Why or why not? Because snow looks clean would you eat it?

Look for other signs of pollution by using magnifying glass and microscope.



TITLE: A Fishless Aquarium

LEVEL: Elementary

OBJECTIVE:

The students will learn that living things come in all shapes and sizes.

MATERIALS:

- 1 qt. milk carton
- 1 qt. clear glass container

DESCRIPTION:

Unfold top of milk carton, wash out thoroughly. Each child takes his carton to the collecting area, stream, pond or ditch. Scrape a small amount of mud from the bottom of the carton. Fill carton nearly full with water. Collect sample of any water plants available. Many animals live on the stems and leaves. Refold top of carton. Tape or staple top together before carrying it away. Dump the samples into the quart jars. Rinse carton by pouring some water from the jar back into the carton. Shake the carton with rinse water, then pour rinse water into jar. Let jars sit for several days for the mud to settle. If jars are set on the windowsills, plants will stay healthy. After mud has settled, the students can study the jars closely to discover any "critters" swimming, clinging to sides of the jar, or on the surface of the mud. Children can examine water samples or scrapings of leaves and stems with magnifiers or microscopes. Encourage them to draw pictures or describe what they see.

RELATED ACTIVITIES:

Creative Writing: stories about the field trip, what they saw in their aquariums; explore reference materials to find out about some of the things they saw

TITLE: Life Cycle of a Plant

LEVEL: Elementary

OBJECTIVE:

Demonstrate the life cycle of a plant.

MATERIALS:

potting soil
pots
radish seeds or pinto bean seeds
Walt Disney's movie "Rites of Spring" (shows the growth of plants)

DESCRIPTION:

Plant the seeds in the pots, recalling their needs; water, warmth, food, sun. Observe and record the growth of the plants each day. Note the development of the stem, leaves, blossoms, seed, death of the plant, leaving the seed for the new plant. If possible, raise the plant where insects can pollinate it. Encourage children to identify each life stage the plant undergoes.

RELATED ACTIVITIES:

Have the children make similar observations of other plants, noting that some plants take much longer to complete their life cycle than others. Follow up with a scrambled sequence of a plant's life cycle. Have the children put them in proper sequence.

TITLE: Classifying Animals

LEVEL: Elementary

OBJECTIVE:

The students will learn that animals are different, but also have some characteristics in common.

MATERIALS:

pictures of animals if real animals are not available
vocabulary words: mammals, birds, fish, reptiles

DESCRIPTION:

Place the pictures of animals of different species along the chalkboard. Have the children sort the pictures into groups of animals that are similar. Evaluate the classification. Was it done correctly? Discuss what the animals have in common; i.e., all those that fly, all birds, all those with fur, etc. Be sure to include body coverings, appendages, etc. in this discussion.

RELATED ACTIVITIES:

After the children identify likenesses and differences, define mammal (hair on body, warm-blooded, etc.)

TITLE: Fossil Fun

LEVEL: Elementary

OBJECTIVE:

The student will make some fossils to acquire a better understanding of what they are and how they are made.

MATERIALS:

large pan
mud
water
objects--shells, fish, bones, crab, claws, bits of coral, etc.

DESCRIPTION:

Fill a large pan with mud from a dried-up puddle. Add water and stir until it is like pancake batter. This is to represent the sediment deposited on the bottom of the sea.

Let the students drop in the various objects. Set the pan aside and allow the mud to dry out. The mud, when hard, is somewhat like the rocks formed when sea sediment hardens.

When mud is dry (completely) let the students break it apart and discover the "fossils" in the rock.

RELATED ACTIVITIES:

Make "fossils" like those that could be found in a lake.

Take a field trip to a lake, seashore or puddle to see how fossils may be formed.



OBJECTIVE:

The students will forecast weather through twice a day observations of temperature, pressure, wind speed, humidity, precipitation and clouds.

MATERIALS:

4-H Bulletin 150, 2B

DESCRIPTION:

Many of the instruments need to be sheltered. There are directions for making this shelter in the bulletin. A hollow pipe should be set in concrete. The weather station should be mounted to a post which will fit inside the hollow pipe, then the weather station can be removed and brought inside to protect it from vandalism.

The basic weather measuring instrument can be easily built. Such simple things as milk cartons, cans and rubber bands are used.

Instruments to make for measuring:

1. temperature - thermometer
2. pressure - barometer
3. wind - weather vane
4. humidity - psychrometer
5. rainfall - rain gauge
6. wind speed - anemometer

If you want to be a weather forecaster, check your instruments twice a day and keep a careful record of temperature, pressure, wind speed and direction, humidity, precipitation and clouds. Your records will form a picture of what's happening and what's going to be.

A sample weather log is included in Bulletin 150, 2B.

RELATED ACTIVITIES:

A good culminating activity would be to go to Bishop Airport and visit the Weather Bureau.

TITLE: Respiration of Leaves

LEVEL: Elementary

OBJECTIVE:

Demonstrate that leaves respire and that a broad leaf will absorb and lose more moisture from the air than a needle-type leaf.

MATERIALS:

balance or accurate scale calibrated in grams
deciduous and evergreen leaves and needles
petri dish

DESCRIPTION:

With scale (or with balance) find a leaf and pine needle of equal weight. Immerse leaf for an hour in a petri dish of water in which food coloring has been added. Then reweigh (or rebalance) the leaves to see that the broad leaf has absorbed more moisture. Put the leaves on the sunny windowsill for an hour. Reweigh (or rebalance) the leaves to check for water loss.

Vocabulary: respiration and osmosis

RELATED ACTIVITIES:

Immerse cut flower into a container of water into which food coloring has been added. Observe how the plant absorbs the colored water.

Examine leaves under microscope to observe stoma and leaf veins.

TITLE: Look 'n' See

LEVEL: Elementary

OBJECTIVE:

The students will go outdoors to observe geometric shapes in natural and man-made structures.

MATERIALS:

paper
pencil
clipboard

DESCRIPTION:

Have the students look for circles, squares, rectangles, triangles, angles, spheres, cubes, and symmetrical and asymmetrical forms. Look at small and large things. Record observations with sketches or words.

Use the outdoors to introduce bilaterally symmetrical (tree leaves); radial symmetry (apple tree trunks); or asymmetrical (elm leaf).

Repeat these observations at different times of the year.



TITLE: Project Survival

LEVEL: Elementary

OBJECTIVE:

To have the student think and experience conditions of survival.

DESCRIPTION:

Take a walk outdoors and ask the students to pretend they are lost in the woods and must stay there for some time. How will they survive? They have no food, materials or tools.

What will they drink? Eat? How will they keep warm? Where will they sleep? How will they start a fire?

Divide the students into teams. Where would they stay as the best environment in the setting? Have them draw maps of the environment; plan their activities.

RELATED ACTIVITIES:

Language Experiences: make up "survival" cards to write a situation and to describe the setting. Have the students react to the situation verbally; discuss TV programs that fit the concept of survival; make a ditto scrapbook prepared by the kids of their recipes for survival (plants, berries, animals, etc.)

Mathematics: mapping the area they have chosen

Research: look for articles in news media that tell about people who have "survived" in the outdoors and discuss them; read books like Stalking the Wild Asparagus for ideas of which plants are edible

Other: play commercially prepared simulation games similar to the field trip experience

TITLE: Water Pollution

LEVEL: Elementary

OBJECTIVE:

Students will describe what water pollution is, identify some of its causes, relate the result of water pollution on resident animals and/or plants and identify positive alternatives for a solution to the water pollution problem.

MATERIALS:

Prepare two large well-balanced aquaria with some type of tropical fish and snails, placing them side by side within the classroom. Inform class that, for Aquarium A, only the correctly prescribed amount of fish food is to be given daily and no other elements are to be added to the water.

For Aquarium B, students may give fish as much food as they wish, feeding them as often as they care to. In addition, any items that students would normally throw away in the classroom wastebasket may, if so desired, be deposited in Aquarium B.

DISCUSSION:

Observe over a period of time what happens to animals and plants living in Aquaria A and B, respectively.

Discuss effects of differential treatment to two aquaria. Observe individual and group conclusions in discussion.

Possible discussion questions are:

- a. What is water pollution?
- b. What are some of its causes?
- c. What positive steps can be taken to alleviate water pollution?
- d. How might the study of these aquaria be compared (generalized) to our lake and river problems?

TITLE: Winter Water

LEVEL: Elementary

OBJECTIVE:

The students will learn collecting techniques and will develop observation skills.

MATERIALS:

bottles with stoppers
data sheet

DESCRIPTION:

1. Collect samples of fresh fallen snow, standing snow and frozen pond or stream water.
2. Compare and record the appearance, odor and taste before and after melting.
3. Boil samples where pollution is suspected.

	Fresh Snow	Standing Snow	Frozen Pond Water
Does it look good?			
Does it smell good?			
Does it taste good?			

RELATED ACTIVITIES:

Mathematics: development and use of charts

TITLE: Rainbow Dripicles

LEVEL: Elementary

OBJECTIVE:

The students will learn how water freezes, the temperature at which it freezes and how an icicle forms.

MATERIALS:

empty cans
nail
cord (for handle)
food coloring

DESCRIPTION:

Use a nail and punch two holes opposite each other along the top of a can. Put the cord through the holes to form a handle. Punch a very small hole in the bottom for water to drip through slowly enough to form icicles.

In another container, mix a few drops of food coloring with some water. Pour this into the first can and hang it up on a tree branch in your yard. (Note: If it is a cold day, the water may freeze in the can before icicles form.) You may have to try this on several different days before you finally produce some homegrown rainbow icicles.

RELATED ACTIVITIES:

Write poems or jingles about how the water freezes.



TITLE: Rearing Insects

LEVEL: Elementary

OBJECTIVE:

As a result of this project children will be able to work out a formula showing the influence of temperature on the number of chirps made by "insect musicians".

MATERIALS:

black field crickets or grasshoppers
glass or plastic containers (1 qt. - 1 gallon size)
soil

DESCRIPTION:

Spread about 2 inches of soil or sawdust on the bottom and place a watch glass on top of this for a water trough. Cover with a lid of screen wire. Keep glass filled with water. Feed insects bread soaked in water, corn mush, mashed potatoes, bits of lettuce and occasionally a delicacy such as peanut butter. For grasshoppers, line the bottom of the container with a sod of grass 2" thick. This provides food and a place for the female to deposit her eggs. Water the grass from time to time.

RELATED ACTIVITIES:

A formula to start with: $T = 50 + \frac{N-40}{4}$

Where: T = temperature in degrees Fahrenheit.
N = number of chirps per minute.

TITLE: Insect-Collecting Station

LEVEL: Elementary

OBJECTIVE:

The students will collect and identify a minimum of fifteen insects to learn more about the relationship of insects to man.

MATERIALS:

insect net
bed sheet
light
jar with lid

cardboard
cotton
fingernail polish

DESCRIPTION:

Many methods can be employed to obtain insect specimens. Below are some suggested methods:

1. An insect net can be used for flying insects.
2. A bed sheet and light are especially good for moths. Place a light in front of a bed sheet and collect insects as they are attracted to it.
3. Use a jar with a lid to collect insects at flowers.

To kill insects for mounting, use a killing jar constructed in the following manner:



RELATED ACTIVITIES:

Label the parts of the insects.

Mount and identify the collection.

Keep data of where various insects are found.

Creative Writing: stories, poems, riddles

Art: sketching, painting

Research: life cycle of the insect, its part in the balance of nature

Reading: poems and stories about insects

Group Census: which insects were found; not found

TITLE: A Whale of a Time

LEVEL: Elementary

OBJECTIVE:

The students will sharpen their research skills and become involved in an environmental concern.

DESCRIPTION:

Students like to get involved. Right? Would you like them to help save the whales? Sound impossible? Not really.

Many excellent articles and books are currently available about whales and the Genesee Intermediate School District has a Jacques Cousteau movie about whales.

Talk with the students to see what they know and what they might want to learn about whales. List possible topics on paper and let the students go at it. Try to think of a money-raising activity your class could sponsor to raise \$10.00. Send it to "Save the Whale Foundation" for their record "Songs of the Humpback Whale."

The students will have a chance to do some research, be involved in a money-making project, receive a record for the classroom and feel as if they have done something to help save an endangered species.

RELATED ACTIVITIES:

Topics: kinds of whales; where whales are found; current laws regarding whale industry; uses of whales; history of whaling; how whales live; how whales communicate with each other; evolution of whales; whale in literature (Moby Dick); difference between baleen and toothed whales

Art: posters on "Save the Whales"; paper maché whales; soap carvings or play dough models

Language: creative stories and poems; letters urging people to stop killing whales; letters to people involved in the study of whales; synonyms for "big"

Mathematics: comparing the size of whales (put a tape strip down the hallway)

Money-Raising Projects: produce a class newspaper about "Whales" and offer it to others for donations; bake or candy sale (proceeds to "Save the Whale Fund")

Resources: Save the Whale Foundation, New York, New York; Songs of the Humpback Whale; Year of the Whale by Victor; Time-Life film-strip on whales

TITLE: Skinning and Curing Pelts and Hides

LEVEL: Elementary

OBJECTIVE:

The students will observe the process of preparing a usable commodity taken from our natural resources.

MATERIALS:

resource person to bring in materials

DESCRIPTION:

Identify a resource person well enough in advance who could secure a carcass to be skinned before the class.

1. Identify types of animal skins used and for what purpose.
2. Identify procedures involved in curing pelts (salt, etc.).
3. Identify the process involved in tanning hides.
4. Identify the uses of fur (coats, gloves, trim, etc.).
5. Identify the uses of leather (gloves, coats, shoes, etc.).
6. Discover texture, color and other characteristics of fur and leather (suede, smooth leather, soft and coarse fur, etc.).

TITLE: Investigating Snow

LEVEL: Elementary

OBJECTIVE:

Students will see a comparison of temperatures at various depths of snow with temperatures in the air and water.

MATERIALS:

thermometers
yardsticks
cans
shovels

DESCRIPTION:

Record the temperature in the following places:

1. air
2. 4" in snow
3. 8" in snow
4. over water
5. 7' above ground
6. ground temperature

Make comparisons and discuss reasons for temperature variations.

RELATED ACTIVITIES:

Using yardsticks, measure the snow at various locations (6) and get the average depth of the snow.

Use cans of equal size and invert vertically into snow. Bring inside and let melt. Measure the amount of water in inches. Eight inches of snow makes about 1 inch of water. Compare this with the amount of water and snow in the containers.

TITLE: Classification of Living and Non-Living Things

LEVEL: Elementary

OBJECTIVE:

To be able to list the most tangible objects under one of two main categories.

MATERIALS:

random objects as seen on a field trip

DESCRIPTION:

Study the needs and functions of living things such as: air, water, heat (sun), food, growth, and reproduction.

Study the non-living things and make collections of rocks, minerals, and soils. Define igneous, sedimentary and metamorphic.

RELATED ACTIVITIES:

Study the use of living and non-living things.

Study the historical use of living and non-living things.

Language: spelling of name, keeping notebooks

TITLE: Parking Lot Art

LEVEL: Elementary

OBJECTIVE:

The students will paint a map of Michigan (upper and lower peninsulas) to scale on the lot.

MATERIALS:

yellow highway paint
12 ft. metal tape

DESCRIPTION:

The size of the parking lot will determine the scale for the map. Cities, rivers, harbors, highways, resources sites, "mountains", dunes, Great Lakes, inland lakes, power lines, state and national forests can be located.

Happily, the map will fade out just as another group of students are motivated to create another scale map of Michigan.

RELATED ACTIVITIES:

Dinosaurs to real-life scale can be sketched on the parking lot. Pop Art can be assembled and displayed on the lot.

TITLE: Pile On

LEVEL: Elementary

OBJECTIVE:

The student will participate in making a compost heap.

MATERIALS:

composting materials (cut grass, leaves, weeds, flowers, refuse,
straw)
area 4 to 10 sq. ft. in size

DESCRIPTION:

Toss into the bottom of the area, 6" layer of leaves. Add 2" layer of soil over which 2 lbs. of high nitrogen fertilizer is sprinkled.

Repeat using alternative layers of the three ingredients. Dish the top so water can accumulate.

In the spring, to hasten the rotting process, cover with black plastic.

Uses: Composting will enhance the study of earthworms, growing mushrooms, keeping daily records on composting changes and comparing plant growth in plain soil and compost.

TITLE: Population--Food Activity

LEVEL: Elementary

OBJECTIVE:

To demonstrate the problem of over-population as it relates to the world's food supply.

MATERIALS:

- 1 extra large shopping bag (or plastic garbage bag)
- 2 grocery bags
- 4 bags medium size
- 8 sandwich bags
- 16 pieces of candy

DESCRIPTION:

Begin with one student representing the population and give him the extra large shopping bag containing all 16 pieces of candy, packaged as follows:

- two pieces of candy in each sandwich bag
- two sandwich bags in each medium size bag
- two medium bags in each grocery bag
- two grocery bags in one shopping bag

Double the population: 2 students each take bag from largest one.
Double the population: 4 students each take bag from one of the two.
Double the population: 8 students each take bag from one of the four.
Double population: 16 students each take a piece of candy from one of the 8 bags. Double the population: 32 students--the new 16 students have no food.

RELATED ACTIVITIES:

1. writing exercises
2. mathematics exercises
3. the influence of a severe drought to a major food-producing area.

TITLE: What is That Leaf?

LEVEL: Elementary

OBJECTIVE:

The students will learn to collect, classify and make prints of tree leaves found in the outdoor study area. They will also learn to create designs from leaves.

MATERIALS:

leaves
color crayons

dish towel
iron

DESCRIPTION:

This activity can be done with any grade level but would probably be most effective in the elementary grades. The following steps should be followed:

1. Have the children collect leaves--stress getting whole leaves that are not torn or otherwise mutilated. (Do this on nature trail or at home.)
2. The children should then color one side of the leaf. (Stress that the more wax and color they get onto the leaf, the better.)
3. Lay leaf on the paper to which the print is to be transferred, place a dish towel over it. Press with a hot iron being sure that enough heat is applied to melt the crayon wax.
4. This process should result in the wax leaving a print of all the veins of the leaf. Next draw around the edge of the leaf with felt pen or other type of marker.
5. Identify the leaf prints. This can be done by using guide books to identify the tree. Put the tree's name under the leaf print.
6. The final prints can be used for an attractive bulletin board. They also can be put into a booklet that the children can take out into the nature area to help identify trees.

Note: The leaves can be colored in their summer and fall colors to aid in the identification. If you like, you can make a booklet of all the types of trees located in your nature study area.

TITLE: Litter Collection Analyses

LEVEL: Elementary

OBJECTIVE:

Students will collect and sort litter.

MATERIALS:

bags
tagboard

felt pens of several colors
newspaper

DESCRIPTION:

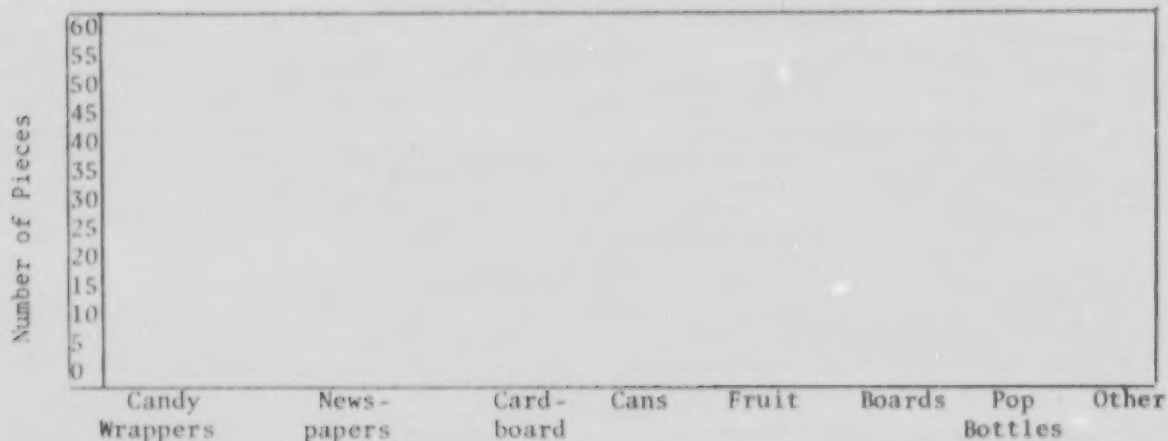
Walk around your school yard. Search for any objects that have been left there by people because they no longer had a use for these materials. Take a shopping bag or some other suitable container with you. Collect enough of these discarded items to almost fill your container.

When you arrive in the classroom, empty your collection on the floor. Cover an area with newspaper and sort on this area. Sort by placing objects into several piles placing similar objects in the same pile. Sort and regroup until you are satisfied with your system of grouping.

RELATED ACTIVITIES:

How many types of litter did you find? Which is the most common? What type of litter is considered hazardous to health? Organize your information to form a bar graph. (Example below.)

NAME _____ TITLE _____ DATE _____



TITLE: Trail Wagon for Nature Trail Materials LEVEL: Elementary

OBJECTIVE:

The students will build a trail wagon to be pulled over rough terrain.

MATERIALS:

wagon
nature collections

DESCRIPTION:

Have the students construct a simple wagon that can be pulled easily over rough terrain. They can pick a special name for the trail wagon.

Gather materials from home, school or nature trail.

RELATED ACTIVITIES:

The students can paint and decorate the wagon to increase their interest in the study.



TITLE: Insect and Spider Race

LEVEL: Elementary

OBJECTIVE:

The students will observe and determine the various adaptations for locomotion in insects and spiders. They will also sharpen skills in observation and develop an interest in insects and spiders.

MATERIALS:

collection cages; i.e., screen boxes or jars with screen tops

DESCRIPTION:

The fall season is an excellent time to study insects, spiders or centipedes and millipedes. If specific adaptations for locomotion are studied, races between different insects or spiders can be held.

Each student collects various specimens and may select the one that he would like to enter in a race. The number and organization of the races can be determined by the number of students in the room. For example, a "preliminary" race can be held on Monday, Tuesday, Wednesday and Thursday with a "final" championship race on Friday. During the whole process the learner is asked to observe and write any discernible difference in the appendages of the creatures that may affect the particular creature's performance. The races are conducted by having a small inner circle and a large outer circle on the floor (chalk can be used). The start of the race is in the small inner circle and the finish is the outside circle.

If desired, insects, spiders, centipedes and millipedes may be compared as far as adaptations for locomotion are concerned.

The student may also get practice in measurement and timing as far as conducting the race is concerned. This depends on the versatility of the teacher.

TITLE: Creating a Junk Man From Litter

LEVEL: Elementary

OBJECTIVE:

The students create a junk man from litter picked up around the school grounds.

MATERIALS:

Use the litter gathered as children cleaned the site.

DESCRIPTION:

When the students return litter to the collecting station, begin to plan with them how some of the materials can be used to make the figure of a junk man. For example, hubcaps, large cans, small cans, beer bottles, bottle caps will become the parts of the junk man's anatomy.

RELATED ACTIVITIES:

Display the junk products to reinforce the need for collection of litter.



TITLE: Observing Snow Environment

LEVEL: Elementary

OBJECTIVE:

To observe the affect of snow on animals and record animal habits.

MATERIALS:

cardboard clipboards
paper
pencil
ditto sheets

DESCRIPTION:

Divide the students into groups of four or five. Assign them to a certain area. Give out ditto sheets with the following questions:

1. What animals would we expect to find living in this area now?
2. What are the needs of these animals?
3. Where would you look for animals around here?
4. What are some of the different kinds of habitat available for wildlife in our group area?

RELATED ACTIVITIES:

Groups explore as many places (environments or habitats) as you can and record animals that you see or any evidence or signs of animals having been in the area; i.e., food, homes, nests, feathers, droppings, tracks, tunnels.

TITLE: Relating "Hot-Cold" to Body Temperature

LEVEL: Elementary

OBJECTIVE:

The students will describe the "feel" of liquids varying in temperature from body temperature.

MATERIALS:

five 1 quart containers

DESCRIPTION:

Fill the five containers with water: can 1 from a hot water tap, approximately 130°F; can 2 from comfortably warm (about 88°F); can 3 from cold water tap (about 56°F); can 4 has been setting at room temperature overnight; can 5 has been setting outside for at least one hour. Have the students feel and describe the temperature of each container. Rank according to heat. If done in winter, children will probably describe can 5 as "freezing cold" rather than "cold". Draw a thermometer on the board with red line to mark body temperature. Draw an approximate temperature mark for each can. Note that the closer to body temperature, the more comfortable. Water will take on the temperature of the air about it. Now note that discomfort begins quickly at temperatures above body temperature but does not begin for a much greater span below body temperature. Describe heat-coolness, etc. in relation to body temperature.

TITLE: Outdoor Math Lesson

LEVEL: Elementary

OBJECTIVE:

The student will practice counting large numbers by gathering materials outdoors.

MATERIALS:

stones
leaves

acorns
any plentiful items found nearby

DESCRIPTION:

Take the children outside for the math lesson and let them gather materials that are plentiful--stones, leaves, acorns, etc.

Students can work around the blacktop or sidewalk areas. Write number in chalk on the sidewalk--like 423--and have a group of children gather and organize those 423 objects.

Besides enjoying their math lesson, they are having another opportunity to appreciate the outdoors.



TITLE: Seasonal Field Trips

LEVEL: Elementary

OBJECTIVE:

Beginning in early April and progressing into late autumn, students will take notes for a diary concerning flowers.

MATERIALS:

pictures of flowers
poems about flowers
books to read
filmstrips
films
slides

DESCRIPTION:

Through the use of wild flower pictures, books, poems and discussion, prepare the class for a field trip to the woods. Explain the purpose. Make an example of the diary to be kept. (similar to below)

Name of Flower	April								May	June	Sept.
	1	2	3	4	5	6	7	8	9, etc.		
Skunk Cabbage											
Hepatica											
Bloodroot											
Toothwort											

A record of the weather may also be kept on the chart or calendar. This will give an opportunity for comparing date of flowering of the plants with those of preceding years.

For a more complete study of spring flowers, try to get three dates for each flower (1) for opening of petals, (2) shedding of pollen (full bloom), and (3) all petals dropped.

TITLE: Make a Mountain

LEVEL: Elementary

OBJECTIVE:

The students will be able to correlate some principles related to the shaping of mountains by observing the erosion of a mud pile.

MATERIALS:

popsicle sticks
crayons
outdoor site
watering can or hose

DESCRIPTION:

Draw lines a centimeter apart across both sides of the popsicle sticks. Color the bands in this order: red, green, orange, blue, yellow and purple.

Go to a patch of bare ground and dig up earth without pebbles or stones. Have groups of students make their "mountain" about 1/2 meter high. Push the popsicle sticks into mountain and surrounding land, red ends out (try to distribute evenly). The orange and blue boundary should be even with the surface.

Sprinkle the "mountain" with water so the "rain" falls straight down.

Continue to erode the "mountain" for several days and observe what happens.

CAUTION: Remind the students not to carry their comparisons too far. Mountains are not piles of dirt which are washed away.

RELATED ACTIVITIES:

Identify geographical (physical) features in miniature: streams (s), canyons (c), waterfalls (w), lakes (l), deltas (d), landslides (ls) and alluvial fans (f).

List of discussion questions.

Graph data daily in some way.

Look for areas around the community that show evidence of erosion.

Research: mountains--how they were formed; life process of mountains: birth, aging, etc.

Community Project: try to save an area that is becoming eroded by utilizing good conservation practices

TITLE: Tip Toe Through the

LEVEL: Elementary

OBJECTIVES:

Students will feel that dark colored objects are better radiant heat absorbers than light colored ones.

MATERIALS:

barefoot kids

DESCRIPTION:

Go to a place where the blacktop meets a concrete drive. Have the kids that want to take off their shoes stand on the blacktop and then on the concrete.

Compare the results and tell why.

RELATED ACTIVITIES:

Extend the concept. Kids can compare other places (sand, grass, etc.). Find out how roads are built to compensate for this concept. Look at homes in different areas. How are they built to adapt to environment?



TITLE: The Relationship of Elevations
to Plant and Animal Life

LEVEL: Elementary

OBJECTIVE:

The students will identify the different animals and plants which exist at different elevations present on the school site.

MATERIALS:

wheat paste
tempera paint
drawing pad on clipboard

DESCRIPTION:

On drawing paper attached to a clipboard, students will sketch assigned areas to indicate elevations. In the classroom a topographical map will be constructed of wheat paste to show elevations present on the school site. Colors will key the different elevations; students will identify the plants and animal life present on the site.

RELATED ACTIVITIES:

Topographical map drawn to precise scale will emphasize mathematics skills.

TITLE: Shake It Up!

LEVEL: Elementary

OBJECTIVE:

The students participate in a firsthand experience of how the abrasion of rock occurs.

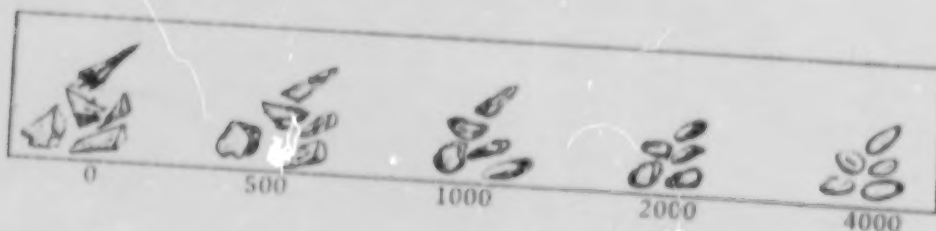
MATERIALS:

red brick (soft)
hammer
jar with cover

DESCRIPTION:

Break red brick with a hammer. Put 6 to 10 angular pieces (about 1" across) in strong, thick-walled jar. Add water until jar is half full, close tightly and place in paper bag in case it should crack.

Have 10 students shake the jar 100 shakes each (not so hard to break the glass). Let the class examine the fragments, observe the color of the water and scrape inside of the jar with their fingernails. Pour water into a gallon jar and let the mud settle. Record the number of shakes, note changes in the mud. Repeat shakings giving fragments 1,000 shakes each day until well rounded.



Trace angular fragments heavily on one side. Place on projector with crayon side down and project on paper taped to wall. Their silhouettes are traced and then cut out. A new set of cut-outs is made after each 1,000 shakes. Always put the fragments in the same position and projector at same distance from the paper.

TITLE: A Crayfish Corner?

LEVEL: Elementary

OBJECTIVE:

The students will observe the behavior and appearance of the crayfish.

MATERIALS:

Teacher's Guide, Crayfish
Elementary Science Study

DESCRIPTION:

Obtain a plastic wading pool or build one using a cardboard box, plastic sheeting, plywood and masking tape. Plastic flower pots (with chipped small doors) make good crayfish houses.

Crayfish may be ordered from a nearby pond or quiet stream.

Students can feed and care for crayfish and observe them over a period of time. They will need to develop a system to recognize their own crayfish.

Students will observe the feeding process, egg-laying, molting and the social order of animals in a small area.

RELATED ACTIVITIES:

Mathematics: weighing crayfish on balance or scale; comparison graphs

Language Arts: creative stories and poems; diary or log of crayfish activities

Art: drawings; models

Science: experiments devised by students (stimulus-response, etc.); dissecting crayfish that die in pool; food experiments; related research

Other: "Crawdad" song; make up a song; creative drama or dance

TITLE: Plant a Pumpkin Patch

LEVEL: Elementary

OBJECTIVE:

The student will plant pumpkin seeds and observe the life cycle of a plant.

MATERIALS:

leftover pumpkin seeds
area to plant seeds

DESCRIPTION:

Utilize that Halloween fun in pumpkin carving. Store some seeds (after they have dried) in a paper envelope until planting time in the spring.

Find a place large enough for students to plant their seeds. In the fall, when students come back, they will be able to observe the life cycle of a plant.

Students can form a "corporation" and sell pumpkins to other students for Halloween. Some can be used for making pumpkin pie for Thanksgiving.

Students will no doubt think of many activities.



TITLE: What is It?

LEVEL: Elementary

OBJECTIVE:

The students will identify ten items in an ecological community.

MATERIALS:

list of things to locate in a community
log sheet
check sheet
pencil

DESCRIPTION:

Take a field trip and visit ponds, meadows and woodlands. Observe the relationships that are peculiar to each place. Notice that certain animals and other life are found in each setting. You will find specific animals in the pond habitat that you will not find anywhere else.

A suggested list of animals follows:

Woodland

Skunk
Squirrel
Cardinal
Bluejay
Violet
Hepatica
Jack in the Pulpit
Trillium
May Apple
Blood Root
Trees (kind)
Owl
Chipmunk
Toads
Deer
Other _____

Meadows

Bob-O-Link
Meadowlark
Field Sparrow
Grasshopper
Snake
Butterfly
Trees (kind)
Goldenrod
Milkweed
Hawk
Rabbit
Fox
Mole
Tree Toad
Pheasant
Mouse
Other _____

Pond

Muskrat
Duck
Redwing Blackbird
Microscopic Life
Turtle
Fish
Dragonfly
Cattail
Waterstrider
Whirlygig Beetles
Tadpole
Skunk
Trees (kind)
Frog
Mosquito
Other _____

TITLE: Planting Trees

LEVEL: Elementary

OBJECTIVE:

The students will prepare a plot for planting trees.

MATERIALS:

bulletin: Common Practices for Planting Seedling Trees, SCD, USDA
stakes
burlap
wire staples

DESCRIPTION:

Measure and mark seven 40' x 40' areas.

Study bulletin to observe recommended practices regarding temperature, season, protecting root hairs and covering seedlings.

RELATED ACTIVITIES:

Determine the rate of mortality one year after planting seedlings.



TITLE: Rain, Rain, Don't Go Away

LEVEL: Elementary

OBJECTIVE:

The students will be involved in plotting the path of a thunderstorm.

MATERIALS:

compass
paper
window

DESCRIPTION:

That next stormy day that the kids have to stay in during recess, use the time to plot the path of the thunderstorm. The students will get so involved there won't be those moments of anxiety.

Prepare a plotting map by drawing a series of concentric circles (1, 2, 3, 4, 5, 6 inch radius). Label 1 mile, 2 miles, etc. Have the students sketch major land features on a map.

When thunder is heard, pupil should move to place to watch for lightning. (north of map to face north) When a child sees lightning flash, he counts seconds until he hears thunder.

Sound travels 1,080 feet per second in the air. Each five seconds between lightning and thunder means a distance of about one mile.

The student should make a dot on his map labeling it "1", "2", etc. for each observation. He will be able to tell the direction and how far away the storm is.

RELATED ACTIVITIES:

Creative Writing: stories, poems

Art: painting a "stormy" picture

Resource People: talk to a meteorologist

Research: what causes lightning and thunder; gods of lightning and thunder in mythology

Data Keeping: compare plot records of more than one storm; frequency of storms

Media: find out about thunderstorms that caused great damage

Review safety precautions.

TITLE: "FeelyMeely"

LEVEL: Elementary

OBJECTIVE:

The student will describe an unknown object by using only the sense of touch.

MATERIALS:

familiar objects
bag, pillowcase or box

DESCRIPTION:

Make your own copy of a popular manufactured game called "FeelyMeely". Put several familiar objects in a bag (plastic garbage bag), pillowcase or box.

Have each student reach into the bag and touch an object. Have the student decide how an object feels - soft, hard, sharp, smooth, rough, etc. Then on the basis of touch, decide what the object is.

Objects of several different shapes and textures should be used so that children can learn to be specific in their description.

RELATED ACTIVITIES:

Discussion: the importance and function of sense of touch, other senses; invent similar type games for other senses (hearing, tasting, etc.)

Resources: Genesee Federation of Blind, Braille, Vacuum Former 2800 (Genesee Intermediate School District)

Writing: description and riddles

Research: Helen Keller

TITLE: Smell Less Taste Test

LEVEL: Elementary

OBJECTIVE:

The students will learn that the sense of taste depends primarily on the sense of smell.

MATERIALS:

similar-textured foods cut or grated into a shape not readily identifiable to the child; i.e., light chocolate cake and gingerbread, grated apple and potato

DESCRIPTION:

Put nose plugs on the child and tell him he has a dish containing apple, potato and rutabaga. Have him identify each of them. When every student has had a turn, tabulate the results and note that the conclusions were random. Try the same with two like-colored drinks.

RELATED ACTIVITIES:

Using nose plugs, have each student taste and identify the following: sugar, salt, alum and meat tenderizer. Have the students identify the four basic tastes that do not depend on smell.

TITLE: Take a Walk in a Wooded Area

LEVEL: Elementary

OBJECTIVE:

The students will identify trees, wild flowers and wildlife.

MATERIALS:

paper on a clipboard
directions

DESCRIPTION:

With the help of your guide, identify five trees and list the characteristics that helped identify them. Find wild flowers appropriate to the season. Note signs of wildlife. Carry home one item on which to do a classroom investigation.

RELATED ACTIVITIES:

Sketch leaves, bark, wild flowers or rock piles.



TITLE: Table-Size Gardens

LEVEL: Elementary

OBJECTIVE:

The students will value the produce of a small garden whether the product is flower or vegetable.

MATERIALS:

seed packets of fast-growing vegetables and flowers

DESCRIPTION:

Keep the garden size as small as a kitchen tabletop. Use well-rotted manure. Mix into the soil and work the mixture several days in a row. Plant seeds according to directions on the packet. Weed and water periodically. Share the procedure with family or classmates.

RELATED ACTIVITIES:

Try some simple salad recipes.

Cook vegetables by a Cantonese recipe.

Arrange flowers in classic styles.

TITLE: Erosion

LEVEL: Elementary

OBJECTIVE:

The students will observe and record data.

MATERIALS:

erosion area on the school site

-or-

construct an incline in the classroom
using soil, running water and a pail
or drain

DESCRIPTION:

The students will place mulch material (leaves, hay, straw, twigs, etc.) over the eroded area and observe over a period of about one month the influence that a mulch material will have on the erosion process.

If the experiment is done in the classroom, the observation can be made for a period of a few hours or a day, depending on how the water is controlled. The experiment may become a controlled type of observation; i.e., the volume of water and the angle of the incline can be varied. In this situation, the actual amount of erosion could be measured and the subsequent amount of erosion control could be determined. This particular activity can be carried out as far as the students or teacher desire.

TITLE: I Spy the Seeds

LEVEL: Elementary

OBJECTIVE:

The students will learn that plants produce seeds, seeds are dispersed in many ways, seeds have many uses and the classification of seeds.

DESCRIPTION:

Nature hike in the fall.

Encourage the students to wear slacks. Before leaving the building they should make cuffs on their pant legs to trap seeds. Walking through the dry weeds will insure a wondrous collection of all kinds of seeds from grain types to burrs. Back in the classroom the children will discover where and how the seeds were collected. They should collect their samples and sort them as to types. Discussion of dispersal and economic uses should follow research.

RELATED ACTIVITIES:

Library Skills

Language Arts: creative writing

Art: design

TITLE: Treasure Hunt--A Direction Exercise

LEVEL: Elementary

OBJECTIVE:

The learner will be able to read the compass and to move according to compass readings to a specific spot.

MATERIALS:

compasses
plastic bag

shovel
candy bars (one per student)

DESCRIPTION:

Divide the class into groups of four or five. Each group should have two or more compasses. Provide each group with a set of specific directions; e.g., go due north for 50 paces until you come to a large oak tree. Give about four or five direction changes and direct the children to a cache of candy bars.

Ask the children to draw a map, being as specific as they can. Have the students make up a story using the treasure hunt as a take-off.

TITLE: Look at the Marginal

LEVEL: Elementary

OBJECTIVE:

Students will count and classify the living and non-living specimens in three habitats.

DESCRIPTION:

Three groups will examine three different habitats, such as a square yard of wood-chip path, a square yard of the neighboring woods or other natural area, a square yard combining wood-chip path and natural area.

Discuss the potential for survival of living plants and animals in three habitats. Find research to back up conclusions.

TITLE: Color IS Functional

LEVEL: Elementary

OBJECTIVE:

The students will observe that body coloring is functional and protective. Body coloring can indicate the habitat of the animal.

MATERIALS:

pictures of animals if real animals aren't available

DESCRIPTION:

Describe the coat of an animal; e.g., zebras have stripes, etc. Show a picture or movie of zebra feeding. The zebra feeds in tall grass hence his coat is striped like the grass. Then show pictures of the rabbit - brown in summer and white in winter for camouflage. Show a filmstrip of the skunk to illustrate that his hunting habits prove that he is a nocturnal animal; a white stripe on his black fur resembles moonlight and shadow.

RELATED ACTIVITIES:

Observe any animals children are likely to bring in. Make inferences about his habitat from his skin, then research the animal to verify or modify original inferences.

TITLE: Day Watch

LEVEL: Elementary

OBJECTIVE:

The students will increase their awareness and understanding of outdoor procedures prior to engaging in the real thing.

MATERIALS:

thermometer
compass
pencil
paper

DESCRIPTION:

Develop skills in observation by asking directed questions and requiring written notations.

Examples:

What is the temperature? (estimate first)
What is the wind direction?
What can you see in the sky?
Is the wind light, moderate or strong?
Is there fog or dew?
Is the sun high or low?

TITLE: Plant Observational Project

LEVEL: Elementary

OBJECTIVE:

Children become aware of things around them from day to day. They learn to observe closely and to examine and describe what they see.

MATERIALS:

any types of plants

DESCRIPTION:

Have each child select a plant or part of a plant to examine and observe for a five-minute period each day. Have him report in writing everything that happens to his plant or any changes that occur. Have him measure any growth. Continue the activity for several weeks. The projects may be either on the school grounds or at the children's homes. Specify the use of scientific controls and the design of record-keeping systems. Some suggestions for items to be selected:

- a rosebud as it expands, blossoms and withers
- a hickory, but as it unfolds in spring
- a corn plant or pumpkin vine
- a plant or animal community on a rotting log or stump



TITLE: Collecting for a Collage

LEVEL: Elementary

OBJECTIVE:

Students will enjoy their skill in spotting unusual lines and formations of natural materials.

MATERIALS:

18 x 24 inch heavy construction paper in pale blue or white
Elmer's glue

DESCRIPTION:

If the students use white paper, the paper will be unevenly painted with sky blue. If blue paper is used, cloud formations can be cut out of white or grey paper.

Students observe while lying on their stomachs in a weed patch. Each person will then cut grasses and weeds of his choosing, collect small, flat pebbles and remnants of seed pods, etc. The base of weeds and grasses are attached to the base line of the construction paper, but the tip and stem are left mobile. Only a few other materials, such as pods and stones should be used to create a real-life collage.

TITLE: Game - "Where Is It"
"What Is It"

LEVEL: Elementary

OBJECTIVE:

Sharpen observation skills in children. Make child more aware of his immediate surroundings.

MATERIALS:

camera
tape recorder

DESCRIPTION:

Take pictures of small segments of the school area; e.g., one doorway, one bush, one section of the entry walk. Have the students identify where each picture was taken. This could be varied. Pass out pictures and have the students go look for the object in the picture.

Tape familiar sounds around schools; e.g., sharpening a pencil, a door closing, writing on a chalkboard. Have the students identify these familiar sounds. A prize might be awarded the one who identifies most things correctly.

Have the students do the photographing or taping to present to the other students.

TITLE: Animal Tracks Tell A Story

LEVEL: Elementary

OBJECTIVE:

The students will identify animals by their tracks.

MATERIALS:

fresh snow

DESCRIPTION:

Before taking the field trip, the students should observe animal tracks by looking at drawings, etc. Discuss what kind of animals are likely to be found in the study area and what their tracks look like.

Note that small animal tracks are thickest under trees or near bush cover (animals seek shelter in winter). Tracks indicate which way the animal is going, whether he is walking or running. Infer why the animal was headed in a certain direction.



TITLE: Recycling

LEVEL: Elementary

OBJECTIVE:

The students will describe and demonstrate personal ways of reusing and recycling various waste products.

MATERIALS:

Place on display some garbage items from home and school (cans, bottles, newspapers, rags, bottle caps, plastic bottles, gum wrappers, soda straws, various bits of paper). Also display items that can be made from garbage (papier-maché objects, an odds-and-ends rack made from discarded jars and/or cans, a vase made of a papier-maché covered bottle, a bottle cap welcome mat, rag potholders, a rag rug, soda straw curtains, "found" art collage).

DESCRIPTION:

Discuss garbage and waste and the objects and how they were made. Discuss waste problems (what to do with it, running out of dump, burning and air pollution). Select three garbage items and discuss what could be done with these items (a soda can, an old brick, a piece of scrap cloth, etc.).

Invite the students to bring an item or two from home that would ordinarily have been thrown out and engage in projects, either group or individual, using these objects so that they are recycled. Display reused articles.

RELATED ACTIVITIES:

Discuss what items can and cannot be recycled by individuals and how items can be recycled.

TITLE: Do You Save Throw-Away Items?

LEVEL: Elementary

OBJECTIVE:

Teach children to look for ways to utilize throw-aways and avoid waste.

MATERIALS:

empty cans
bottles
imagination

DESCRIPTION:

Have each child find something of use to make out of a normal discard. Let each child choose his own discard and finished product. Results might be tote bags that start with gallon milk cartons, a set of glasses from pop bottles (child will furnish own bottle cutter), bird feeders or houses from plastic bottles, door "screens" out of bottle rings. The sky is the limit!



TITLE: Game: What Am I?

LEVEL: Elementary

OBJECTIVE:

Students will improve skills in describing a plant or animal.

DESCRIPTION:

Each child will choose an animal or plant. In turn each child will describe the object, but not identify it. He should be specific about size, function, color, etc. Other children guess what it is.

Example: I am a large animal. I live in the woods. I am brown.
I like to eat berries and fish. If you camp near me, I
will steal your food. I hibernate in a cave all winter.
(I am a brown bear.)

TITLE: A Christmas Tree for the Animals

LEVEL: Elementary

OBJECTIVE:

To observe and identify animals and animal tracks in a given area. To promote an attitude of sharing.

MATERIALS:

tree in nature area (preferably evergreen)
straw
popcorn, suet balls, corn on the cob, nuts, birdseed, berries, peanut
butter balls mixed with coarse bread crumbs, star-shaped cookies
and any other appropriate food for animals

DESCRIPTION:

Procedure:

1. Introduce the project to the children.
2. Learn about the kinds of animals that are active during the winter months.
3. Talk about the kinds of food animals like.
4. Learn about the tracks animals make.
5. Select with the children an appropriate tree to decorate.
6. Collect goodies for the tree.
7. Decorate the tree.
8. Put straw around base of the tree.
9. At regular intervals throughout the winter, visit the tree to replenish the food and observe the animal tracks.
10. Have the students keep a record of the animals.

RELATED ACTIVITIES:

Music: before the holiday season a sing fest for several grades together or even the entire school would be great fun

Language Arts: creative writing; stories of animals and of the meaning of Christmas, etc.

Mathematics: data collecting; charts; graphs

Art: outdoor sketching

TITLE: Examination of Winter Birds and Bird Foods

LEVEL: Elementary

OBJECTIVE:

The students will be able to identify several species of winter birds. They will also be able to identify several sources of bird food.

MATERIALS:

commercial birdseed
woven string bags

plastic jug

DESCRIPTION:

Research birds that stay at home during the winter months from pictures, field trips, etc.

1. List winter birds.
2. Classify types of bills of birds and relate to types of food eaten; e.g., chisel-tipped--woodpeckers for digging holes, stout bill of sparrow used to crack seeds.
3. Classify birds under the headings of seed eaters and meat eaters.
4. Study the contents of a box of commercial birdseed. Graph on a chart the most common and least common types of food found in a box of birdseed. Note the size and variety of seeds - discuss the reasons.

Make a list of plants in your area that furnish food for birds in the winter; e.g., thornapple, wild grape, sumac, dogwood, etc. Look in fields, fence rows, roadsides, gardens, nature areas. Note what plants have bird tracks around them. Discover which birds eat in groups and which eat singly. Discuss the need to supply food in the winter months.

Decide what types of bird feeders can be built for birds and make the more simplified ones. Pine cone with melted suet and peanut butter, woven string bag feeder with suet, plastic jug are some types of bird feeders. More elaborate ones may be purchased or made by wood-working departments or children with the help of an adult. Locate bird feeders where birds frequent along nature trails. Go on field trips once a week to replenish the supply of food. Have a different room responsible for this job each week.

RELATED ACTIVITIES:

Art: drawings of birds

Music: bird songs

TITLE: Art Activity - Winter Weeds

LEVEL: Elementary

OBJECTIVE:

Students will collect and identify various weeds, and begin to appreciate the beauty in creating from natural objects.

MATERIALS:

meat tray
glue
poster paint or water colors

DESCRIPTION:

This activity should be done in late fall after a hard frost. Go into a field and gather several varieties of weeds. Take them into the classroom and have each student sort those that he will use for his art picture. Place the weeds on the tray, and move them about until a pleasing arrangement is found. Paint the background.



TITLE: Environmental ABC's

LEVEL: Elementary

OBJECTIVE:

To make the students aware of the environment.

MATERIALS:

paper
pencil
nature magazines or books; e.g., Ranger Rick

DESCRIPTION:

Each child starts with the letter A and works his way through the alphabet. A picture of an animal that begins with each letter can be drawn. As the students learn to write, they can make up a sentence about each animal they have drawn using as many words as possible that begin with that letter.

As the students get into the middle grades, they can write couplets or stories about the animal. In the upper grades, a research unit could be done on the animal.

Students will need help with the letter Q (quail or quacking ducks) and X (oxen, foxes). This could then aid to learning letters, sounds, alphabet in sequence, writing, writing jingles, research on animals, art work and your imagination.

Example: Alligators are awful (1st grade)

Dear ducks in the lake
Dive daringly after the drake (3rd grade)

Snakes are sure to be super
As they search for mice for supper (3rd or 4th grade)

Brown Bear--The life cycle of the brown bear, its habitat, feeding and mating habits. (Report by 6th grade)

In the sixth grade, each student could be assigned a different letter and the results could be compiled into a class book.

TITLE: Making a Balanced Terrarium

LEVEL: Elementary

OBJECTIVE:

The students will observe, make decisions and collect materials for a terrarium.

MATERIALS:

container which can be sealed
charcoal
gravel
sand
garden soil
moss

small pan for a pond
black woods soil
plants
animals
fungi

DESCRIPTION:

Put charcoal and gravel in the bottom of the terrarium for drainage
Then a layer of sand
Next a layer of garden soil
Last black woods soil
Bury a pond in one end
Have the soil slant toward that end.
Set the plants
Push moss in between the soil and the glass
Add the animals
Dampen the soil
Seal the top

If mold starts growing let air into the terrarium.

If you have animals, be sure to find out what they eat and feed them.

TITLE: The Search for Stones

LEVEL: Elementary

OBJECTIVE:

The students will participate in collecting and sorting stones of different sizes and be aware of the names of the different categories.

MATERIALS:

stones
outdoor site

measuring materials
labels

DESCRIPTION:

Have the students go outdoors and gather rocks of various sizes. Each student is to bring back four or five different sizes.

When the children return, ask them to arrange themselves in a line from the smallest to the largest. This is not always easy to do but usually holds their interest.

Examine the completed line and then introduce the concept of size with reference to rocks.

Have materials ready for the students to use in measuring to establish the concept of varying sizes.

Sizes: boulders (more than 256 mm)
 cobbles (64 to 256 mm)
 pebbles (4 to 64 mm)
 granules (2 to 4 mm)
 sand (1/16 to 2 mm)

Have the students fill in any sizes that seem to be missing.



TITLE: Visit the Cemetery

LEVEL: Elementary

OBJECTIVE:

The students will take part in activities of their choice and express their values, feelings and attitude before and after the visit.

MATERIALS:

cameras
measures
art materials

DESCRIPTION:

An unusual outdoor experience is the trip to the cemetery. Prior to going, discuss with the students some of the "procedures" involved in walking around the cemetery. Also, ask the students to discuss what they might like to learn. Gather up many materials--art materials, measuring instruments, cameras, etc., and off you go. There are many possibilities and a visit to the cemetery is a good beginning.

RELATED ACTIVITIES:

Social Studies: comparing dates on headstones as to wars, etc.; relating "old" names to streets and buildings in the community; how in earlier times, people died at younger ages; research into memorial insignias from wars, etc.

Science: look at surrounding areas--how it is cared for; what changes have been made medically over the years to change the life span; materials used on tombstones

Language: epitaphs; compile their data into a book (classbook); creative writings; stories; poems

Art: rubbings of tombstones; comparing the designs

Mathematics: figuring out ages, oldest grave, person, most plots, etc.; unusual way of writing information on tombstones; shapes of stones; measuring the site with dinometer; graphs

Other: perhaps students will verbalize things of a personal nature related to the trip to the cemetery that needs to come out from inside of them

Feelings: students that were apprehensive about the trip prior to going verbalize that they were not uncomfortable or uneasy but INTERESTED in all the things they found

TITLE: Up, Up and Away!

LEVEL: Elementary

OBJECTIVE:

The students will release balloons and locate the landings.

MATERIALS:

postcards
string
map pins
helium

road maps (Michigan, Ohio, Canada)
9" - 11" balloons (Raffoul Advertising
Specialties, S. Saginaw St., Flint)

DESCRIPTION:

Students should prepare data cards as follows:

FRONT	BACK												
Student's Name School Address	<table border="1"><thead><tr><th>Date</th><th>Time</th></tr></thead><tbody><tr><td colspan="2">This is a 7th grade Science Project on weather. Please fill in the following: Place found (town, road) _____,</td></tr><tr><td>Date _____,</td><td>Time _____.</td></tr><tr><td colspan="2">Other comments:</td></tr><tr><td colspan="2">Finder's Name _____</td></tr><tr><td colspan="2">Address _____</td></tr></tbody></table>	Date	Time	This is a 7th grade Science Project on weather. Please fill in the following: Place found (town, road) _____,		Date _____,	Time _____.	Other comments:		Finder's Name _____		Address _____	
Date	Time												
This is a 7th grade Science Project on weather. Please fill in the following: Place found (town, road) _____,													
Date _____,	Time _____.												
Other comments:													
Finder's Name _____													
Address _____													

Tie a string to the card. Fill the balloon but not completely as it will expand at higher altitudes. Tie in a knot and have the students tie the card to the balloon.

The students should note the hour the balloons are released, wind directions (local prevailing), wind speed, barometer pressure, clouds, etc. Compare their findings to weather bureau reports.

When the cards are returned, map pins are used to locate finder. Cards and letters are posted in display cases for all to share.

A final activity is to compute air distances and average speed.

Send ditto letters to each finder who sends his name and address on a card giving highlights of the project and thanking him for his interest.

TITLE: Symbols for Solid Waste

LEVEL: Elementary

OBJECTIVE:

The students will tally evidence of solid waste and decide on action.

MATERIALS:

one wire coat hanger per student
tally sheet for each student

DESCRIPTION:

Ask each student to bring a hanger to school. Bend it in the shape of a circle before going outside. Explain the process that will be used: (1) students will throw the circle hanger at least ten times; (2) they will tally the information and (3) students will develop symbols for litter.

Record evidence of litter found in each throw

Throws:	1	2	3	4	5	6	7
P							
G							
BC							
PL							
etc.							
etc.							
etc.							

KEY: P = paper; G = glass; BC = bottle caps; PL = plastic

Students will have a sample of solid waste and identify the areas which seem to be more densely covered. From the experience many ideas can emerge. Some students may wish to compile all data; others may suggest ways of cleaning the areas.

TITLE: Animal Talk

LEVEL: Elementary

OBJECTIVE:

The students will observe living things in their natural habitat and will write following the trip.

MATERIALS:

Select a wooded area close to the school that will insure you of observing several birds and animals.

DESCRIPTION:

Take the students out on a nature trip. The students should be pre-instructed to observe these animals and birds trying to determine where they live, what they eat, their nesting habits and relationships to other animals of different species.

After they have made these observations for a class period or afternoon (you set the time period), students would be encouraged to write a story related to what they saw.

Suggested titles:

"What it's like to be a _____" (bird, squirrel, rabbit)

"Hello, my name is _____" (Randy Rabbit, Sammy Squirrel, Barney Bird..)

RELATED ACTIVITIES:

Discussion of first and third person narratives.

Dr. Doolittle's story and song: "If I Could Talk With the Animals".

Invent an animal language: what various sounds mean.

Investigate how animals communicate.

Reading: stories of animals written in the first person -
Charlotte's Web, Stuart Little, etc.

TITLE:

LEVEL: Elementary

OBJECTIVE:

The students will identify approximately ten common species of trees by using a tree identification key.

MATERIALS:

leaf keys (for small groups)
books on trees

DESCRIPTION:

Find a good tree key and familiarize the class with its use and the terms. Tree books should be available for some time before a field trip takes place.

Divide the class into small groups and provide them with a key. Go to an area where several of the trees grow. Actual identification should take place by group, but individuals should collect leaves which they can identify. Have the students display the leaves with identification labels.

RELATED ACTIVITIES:

Comparison: leaf shapes, arrangement on twigs, leaf margins,
compound and simple leaves

Art: draw pictures of leaves

Research: different trees, activities that can grow out of the
nature walk

Make up riddles or electric quiz board questions.

Using carbon paper, press the leaves.

TITLE: The Crew at the Zoo

LEVEL: Elementary

OBJECTIVE:

The students will be part of the planning and follow-up for that "yearly" trip to the zoo.

DESCRIPTION:

Before going to the zoo, what do the students want to see? Make a list of all the animals. When you get to the zoo, find out their natural habitats. Are they social animals? How are the animals equipped for locomotion? What is their origin? zoo habitat? eating habits? Compare zoo food to natural food.

After the trip, observe animals for short periods of time inside the classroom. Try to find animals on the school site.

RELATED ACTIVITIES:

Social Studies: research on the history of zoos; how zoos are changing; what zookeepers have to do

Art: painting; 3-dimensional paper sculpture; paper maché; dioramas showing habitats

Language: write stories about animals; poems; write to famous zoos for information and brochures; learn specialized words such as: "pride" of lions, "herd" of cattle, sow, piglet; make an ABC book on animals

Reading: read fiction books about certain animals (Mr. Popper's Penguins, etc.)

Other: photography (zoo trip); watch TV programs on zoo trips

TITLE: Soil Sample Study

LEVEL: Elementary

OBJECTIVE:

To understand water-holding characteristics of soil as related to invertebrate life in each.

MATERIALS:

1/2 bushel of the following soils:

sandy area soil
clay area soil
wooded area soil
uncultivated area soil

DESCRIPTION:

Each student will pull apart a small amount (about 1 sq. inch) of each type of soil. Invertebrate in each soil will be counted and a record kept.

A small amount of each soil will be placed in its funnel which has a gauze over the narrow end. A measured amount of water is poured over each soil sample and at a given amount of time the run-off water is measured.

The water holding ability of the soil samples is then compared to the number of invertebrate found in them.

RELATED ACTIVITIES:

field trips to examine soils

Mathematics: invertebrate in a ton of soil (estimate)

Language: spelling and stories

Science: different kinds of invertebrate

TITLE: Temperature: A Winter Project

LEVEL: Elementary

OBJECTIVE:

To measure and observe differences in temperature.

MATERIALS:

best available thermometer

DESCRIPTION:

Measure and discuss the differences in temperature between the classroom and the outside.

Using the outside temperature as a constant, check the following:

1. Is there a difference in temperature between the windward side and leeward side of a building?
2. Is there a difference in temperature between an open field and a wooded area?
3. Is there a difference in temperature between the top of a knoll and the bottom of a gully?

RELATED ACTIVITIES:

Health: appropriate clothing for indoor and outdoor wear, fashion show

Creative Writing: stories of indoor and outdoor fun in the wintertime

Art: "What I see outside the classroom window"

Math: reading a thermometer, making a chart, making a line graph

TITLE: Observing the Snow Environment

LEVEL: Elementary

OBJECTIVE:

The students will observe the influence of snow on plants.

MATERIALS:

cardboard clipboards for each student
pencils

DESCRIPTION:

In the classroom, discuss what to look for in the snow; namely, depth, texture, dryness, wetness, good packing, etc. Check to see what influence the snow has on plants and trees. The students are divided into small groups and are assigned to investigate a certain area. They are to observe, investigate and record their observations of the snow environment on plants, small trees, weeds, seeds on snow, bare spots around trees, branches, moss, etc.

RELATED ACTIVITIES:

Discuss investigations. List or tabulate information.

TITLE: Boulder Scatter Field

LEVEL: Elementary

OBJECTIVE:

Students will create rock collections from specimens in the scatter field.

MATERIALS:

protective goggles
rock hammer

DESCRIPTION:

When an excavation for a new school or other construction in the neighborhood occurs, make a move to have the heavy equipment carry some boulders to the school yard. Locate at some distance from the windows. Help the children master the skills needed to split rocks.

TITLE: The Call of the Wild

LEVEL: Elementary

OBJECTIVE:

The students will be able to recognize the calls and songs of various animals and will understand the behavioral patterns of social groups of animals.

MATERIALS:

records of animal sounds; i.e., frogs and toads, birds, wolf calls, etc.

DESCRIPTION:

Repeated listening to the records will result in easy recognition of different animal songs and calls. The wolf record is especially helpful in understanding animal communication, territoriality and the hierarchy of the pack. Advanced students could be encouraged to do individual research of a particular kind of animal and relate their behavior patterns to their own.

TITLE: Web of Life

LEVEL: Elementary

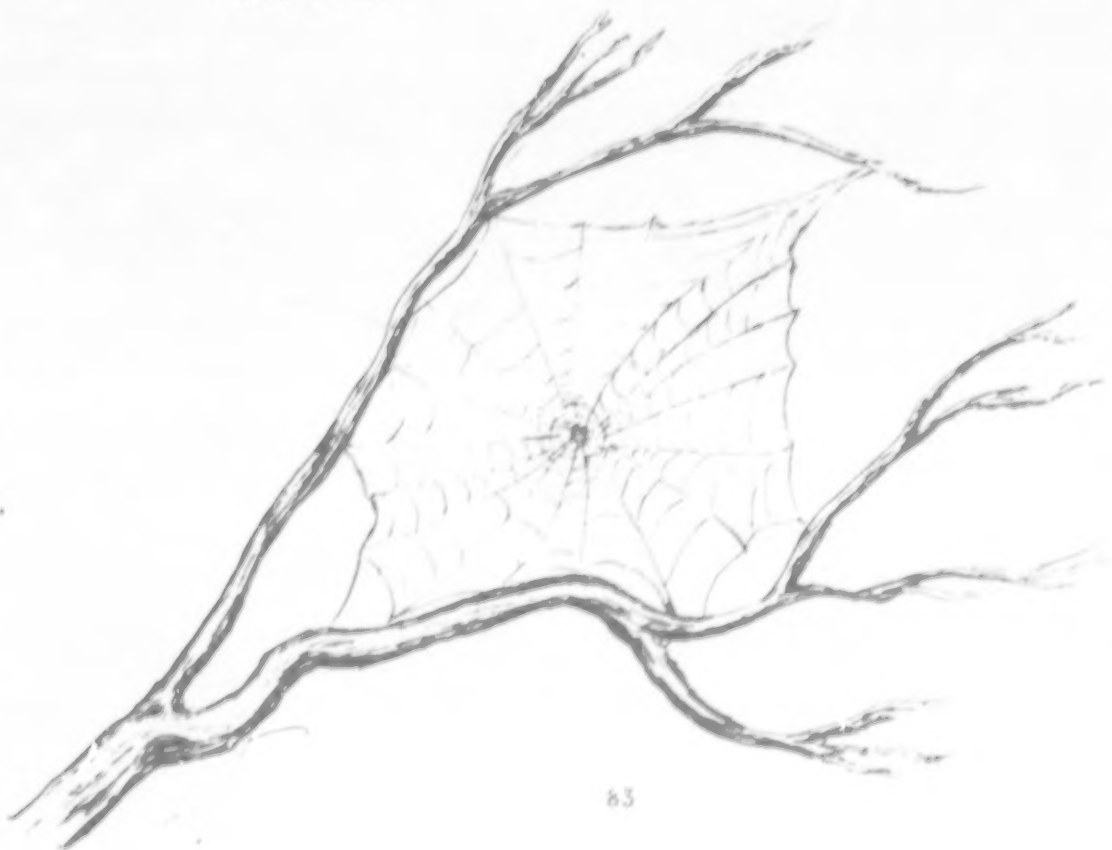
OBJECTIVE:

The student will investigate the inter-relationship of living things.

DESCRIPTION:

Each child in the class reports to the nature area and marks off with a stick a 1 foot square. The children are then encouraged to find as many different items of nature as possible. The child collects the items and returns to the classroom with his collection. Upon returning to the classroom the child begins his research.

1. Identify the items collected.
2. How does each item fit into the environment?
3. What part does it play in the total cycle?
4. What would happen if each item found were removed from the environment?



TITLE: Observation: Dead Animals and Decay

LEVEL: Elementary

OBJECTIVE:

The students will observe the process of decay over a period of time.

MATERIALS:

chicken wire
wooden stakes

DESCRIPTION:

"Guess what, teacher, I found a dead ____." Don't panic--put that great discovery to use.

Do not let the students touch the animal without using gloves. If the animal will not be used immediately, put it in a plastic bag and freeze it.

When you are ready, you can place it in the outdoor environment. Stake it down carefully with small screening or small chicken wire and wooden stakes.

Observe and record what happens to the dead animal over a period of time. Students will see evidence of nature's process of sanitation.

Decay and decomposition will be occurring before their very eyes. If lucky, perhaps your students will have a skeleton of the animal.

Students should understand that animals should not be killed deliberately. There are many animals lying by roadsides that might be utilized for this purpose.

RELATED ACTIVITIES:

Logging the trips outside to visit the animal.

Determining which animals come to the carcass.

What happens to the animal (carcass) during different seasons of the year?

Take photographs of the process over a period of time.

Speculating as to the cause of death of the particular animal.

Relating the decaying process to the balance of nature--animals that feed on the carrion of dead animals.

Observation: Dead Animals and Decay (Continued)

Predicting what will occur in the decay process. How long will it take? What factors will influence the decay process, etc.?

Using the bones to rebuild a skeleton of the animal.

How does nature benefit from the process of decay?

TITLE: Pebble Pups at Work

LEVEL: Elementary

OBJECTIVE:

The student will identify rocks by comparison of appearance and descriptions on the worksheet.

MATERIALS:

copies of Outdoor Lab Worksheet

DESCRIPTION:

Gather rocks from local gravel pits or cut stone dealers and place them in an outdoor setting. Tape numbers on the rocks that will be identified. Prepare an Outdoor Lab Worksheet for your students.

Students will take the worksheets to the outdoor area and examine and discriminate among the rocks.

Some students may wish to gather other examples of rocks and try to match them to the examples provided by the teacher.

Rock Identification
Outdoor Lab
Name _____

Directions: Write the number of the rock described.

1. This rock is called "pudding stone" because it is white with chunks of red rocks (jasper) mixed in it, which make it resemble cherry pudding. _____
2. This rock is limestone and very easy to identify because it has fossils in it. _____
3. This rock exhibits "glacial striations" (or scratches) which were produced as the glacial moved it along. _____
4. Granite makes beautiful tombstones because it is very durable and takes a high polish. _____

Pebble Pups at Work (Continued)

5. Slate is used in making blackboards. It breaks very clean and smooth in layers. It's color is usually gray. _____
6. This rock is Gneiss (pronounced "nice"). It looks nice because of the pretty colored bands running through it. _____
7. This rock is conglomerate. It is a conglomeration or mixture of various sized pieces of gravel cemented together. _____
8. This rock has an intrusion. This rock has a streak of another type of rock running through it which was molten. _____

TITLE: Key to Bird Nests

LEVEL: Elementary

OBJECTIVE:

Students will collect abandoned bird nests in the fall and during the winter when the nests can be seen easily.

MATERIALS:

A copy of the Key should be furnished to each student.

DESCRIPTION:

The nests can be labeled and stored in shoe boxes so that the more fragile ones will not fall apart.

The attached Key will assist with the identification.

PARTIAL WINTER KEY TO ELEVATED NESTS OF BIRDS NESTING IN SOUTHERN MICHIGAN

- A. Platform nests, containing sticks or large twigs
 - B. Bulky nests in trees, and over 15 inches outside diameter.....Great Blue Heron
 - BB. Smaller nests, less than 15 inches outside
 - 1. Some lining.....Cuckoo
 - 2. No lining.....Mourning Dove
- AA. Cup-Shaped nests
 - I. Statant (standing)
 - B. Containing sticks or large twigs
 - C. Bulky nests in trees and over 15 inches outside diameter
 - 1. Lining of bark.....Crow, Great Horned Owl, Long-eared Owl
 - 2. Lining of leaves..Red-shouldered Hawk, Red-tailed Hawk, Cooper's Hawk
 - CC. Smaller nests, less than 15 inches outside
 - D. Inside diameter under 3 1/2 inches; in shrubs, thickets, scrubby trees
 - E. Lining of leaves and rootlets
 - 1. Over 3 inches inside diameter....Brown Thrasher
 - 2. Under 3 inches inside diameter..Catbird
 - EE. Lining of bark and wool....Migrant Shrike
 - DD. Inside diameter over 3 1/2 inches; in trees, often evergreens.....Blue Jay
 - BB. Containing no sticks
 - C. Felted nests of cottony material, not lichen covered
 - D. Nest wider than high.....Goldfinch
 - DD. Nest higher than wide
 - E. Thick walled
 - 1. Vertical crotch of shrub near marsh or water.....Yellow Warbler
 - 2. Saddled on horizontal branch of tree...Least Flycatcher
 - EE. Thin walled and usually close to trunk.....Redstart
 - CC. Not felted or is lichen covered
 - D. Containing mud
 - E. In Trees
 - F. Grasses primarily
 - 1. Under 4 inches inside diameter....Robin
 - 2. Over 4 inches inside diameter.....Bronzed Grackle
 - FF. Leaves and usually moss.....Wood Thrush
 - EE. On buildings, bridges, cliffs, etc.
 - F. Grasses primarily, mud inside
 - 1. Under 4 inches inside diameter...Robin
 - 2. Over 4 inches inside diameter.....Bronzed Grackle
 - FF. Moss and mud outside.....Phoebe
 - DD. Containing no mud
 - E. Lichen covered, saddled on branch
 - F. Very small.....Ruby-throated Hummingbird
 - FF. Larger
 - 1. Over 1 1/2 inches deep...Blue-gray Gnatcatcher

Key to Bird Nests (Continued)

- 2. Under 1 1/2 inches deep.....Wood Pewee
 - EE. With no lichens
 - F. Mostly of bark, fibers and rootlets, with or without horsehair
 - G. Thin, flimsy
 - 1. Little or no lining.....Rose-breasted Grosbeak
 - 2. Considerable lining....Scarlet Tanager
 - 3. Containing few twigs and hair...Cardinal
 - GG. Thick, well formed, usually with some cotton
 - 1. About 1 inch deep, often over water.....Kingbird
 - 2. About 1 1/2 inches deep, with grass streamers....Cedar Waxwing
 - FF. Mostly of grasses, rootlets, straw and leaves, usually hair
 - G. Containing many leaves; low in thickets...Indigo Bunting
 - GG. With few or no leaves; less than 1 1/2 - 2 inches inside diameter
 - 1. Thick lining of horsehair.....Chipping Sparrow
 - 2. Few or no hairs.....Field Sparrow
- II. Adherent (held)
 - B. Containing twigs; in silos, chimneys, hollow trees.....Chimney Swift
 - BB. Containing mud; in buildings.....Barn Swallow
- III. Pensile (Hanging)
 - B. In reeds or swamp shrubs
 - C. Open above
 - 1. Resembling platform.....Bittern
 - 2. Deeply hollowed.....Red-winged Blackbird
 - CC. Spherical nests, opening on side...Long-and Short-billed Marsh Wren
 - BB. In upland shrubs and trees
 - C. Less than 2 inches inside depth
 - 1. Low branches of trees (usually small trees).....Red-eyed Vireo
 - 2. Tree tops or outer branches.....Warbling Vireo
 - CC. Over 2 inches inside depth (pendulus)...Baltimore Oriole
- IV. Pendulous, or fibers, strings and the like....Baltimore Oriole

PREPARED BY: H. Lewis Motts, Jr.
Kalamazoo Nature Center, Inc.

TITLE: Topographic Relief Mapping

LEVEL: Middle School

OBJECTIVE:

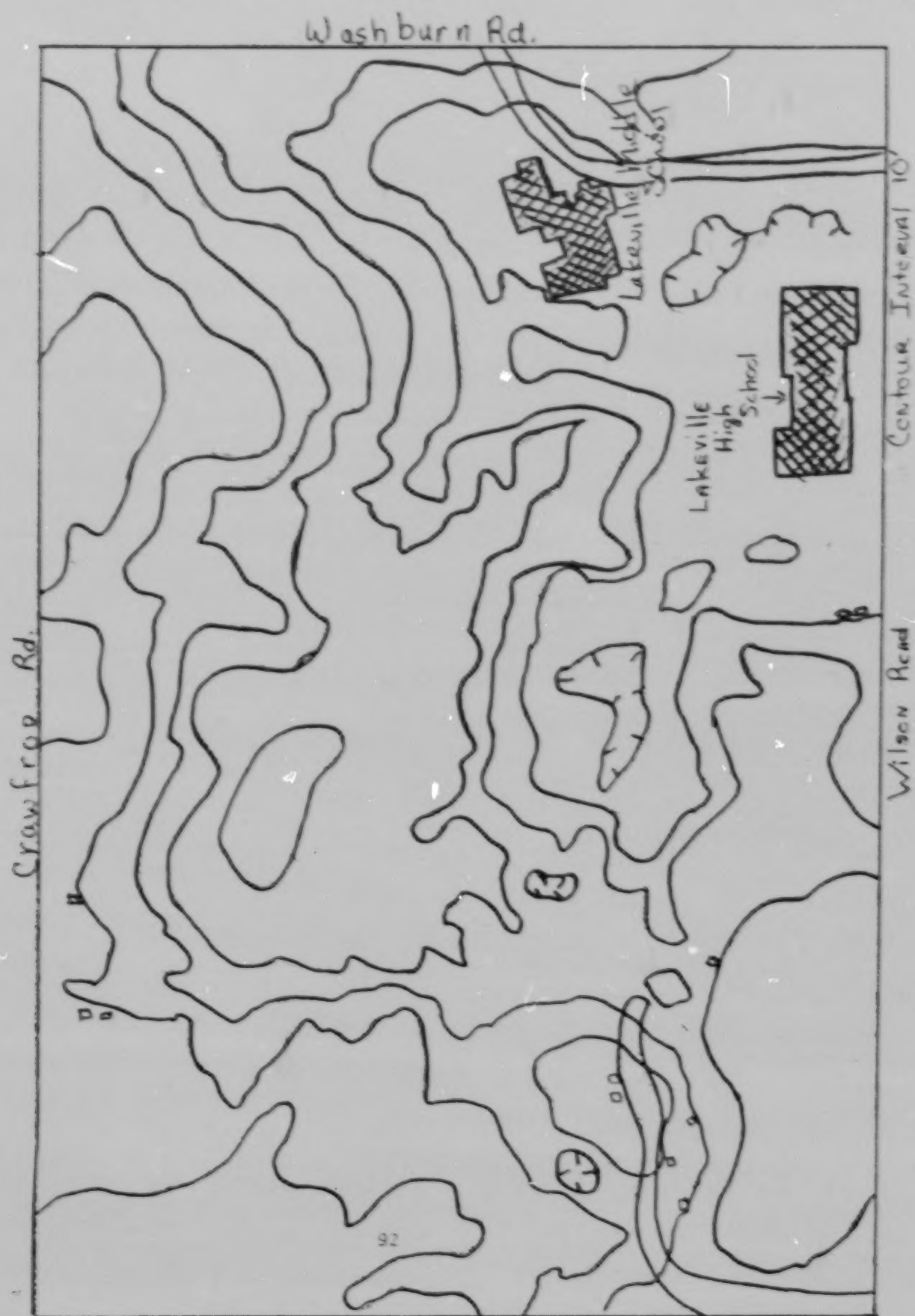
The students will develop mapping skills while producing a model of surface relief features.

MATERIALS:

United States Geological Survey Quadrant
scotch transparency film
plywood

DESCRIPTION:

Select the area to be mapped (school area, district, etc.). Determine the scale to be used ($1/4" = 10'$, $1/8" = 10'$, etc.). Secure a U.S.G.S. (U.S. Geological Survey) quadrangle map for the area desired. Then trace the area desired onto a piece of white paper (black #2 pencil on white paper). Using Scotch transparency film, produce an overhead projection transparency of the area. Using a piece of $1/4"$ or $1/8"$ plywood, project the image of the area there and draw a topographic map. For each succeeding contour level, produce a pattern which will be cut out of a second sheet of plywood of the same thickness as the first piece. Trace the contour level on each level. Cut out each layer and sand the edges. Glue the layers together as in a layer cake. Top layer will probably have several unconnected areas. Paint each layer a different shade. Darkest color should represent the basic layer with colors diminishing in darkness as they build up contour layer by contour layer. Locate the major physical and man-made features such as schools, houses, roads. Color them in or build up scale models to glue on the map in location. Now you have a topographic relief map displaying contour relief, physical buildings and land forms. You can begin to locate tree patterns, crop rotations, stream patterns or any other items desired.



TITLE: Geological Mapping of Structural Section: LEVEL: Middle School
Three-Dimensional Map

OBJECTIVE:

The students will draw a three-dimensional map of the structural unit represented by the rock outcrop.

MATERIALS:

clipboard
drafting pencils
graph paper

ruler
colored pencils

DESCRIPTION:

Pace the distances between the rock outcrops and indicate the distances and locations of outcrops on topographic map. Determine from the lay of the rocks the structural unit represented by the rock outcrops and draw, using dotted lines, the missing rock layers. The intact rock layers should be indicated with solid lines on the map. The finished map will be a three-dimensional representation of a structural dome. (Drill holes show other underlying rock layers, be sure to incorporate these layers into your map.)

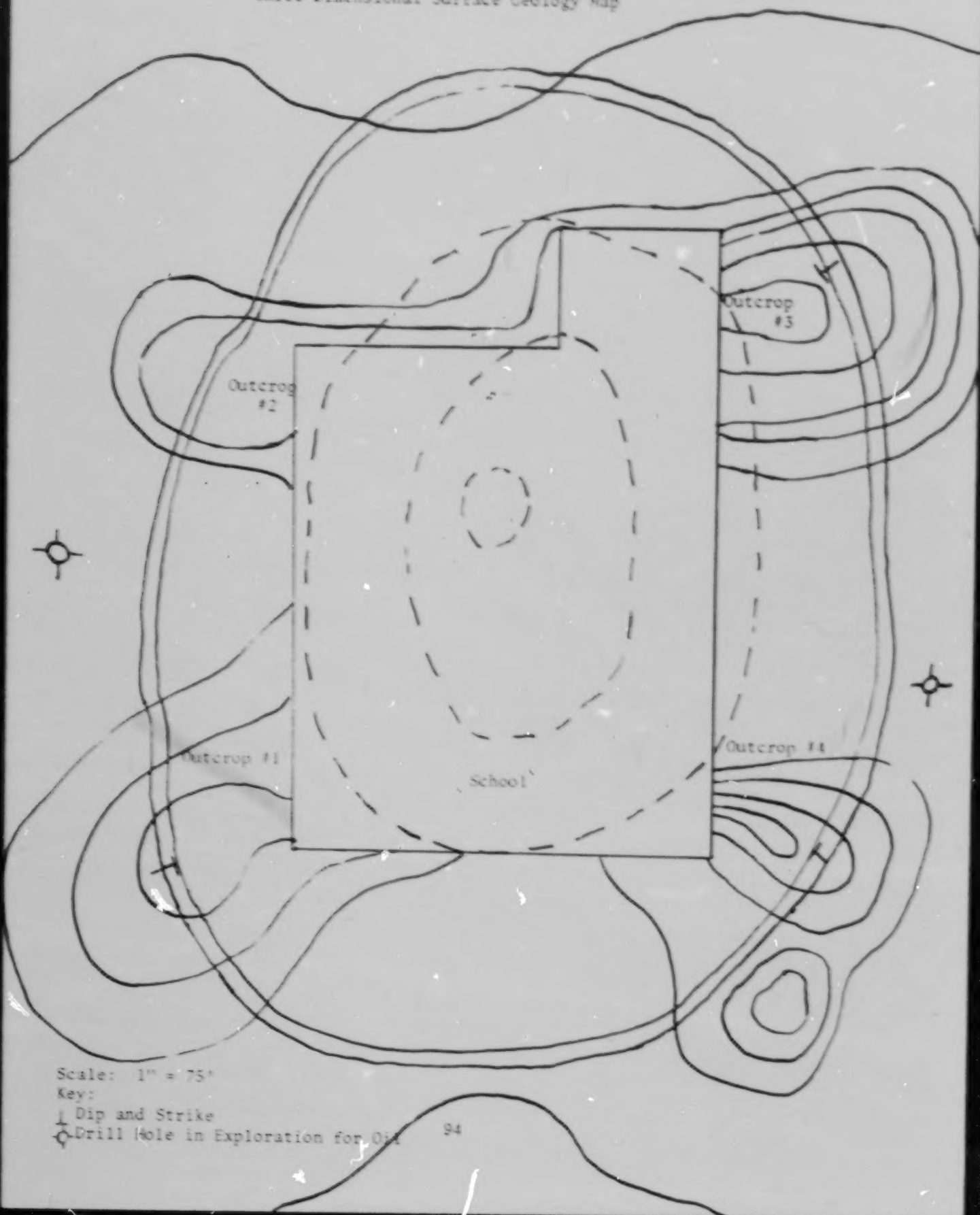
RELATED ACTIVITIES:

Estimate distances using the average pace.

Make a topographic map.

Make a three-dimensional model using different colored clay.

STRUCTURAL DOME PROPOSED FOR ARMSTRONG MIDDLE SCHOOL
Three Dimensional Surface Geology Map



Scale: 1" = 75'

Key:

⊥ Dip and Strike

⊙ Drill Hole in Exploration for Oil

TITLE: Calling Wild Birds Without a Whistle
or Caller

LEVEL: Middle School

OBJECTIVE:

The teacher and students will be able to call in birds to study.

MATERIALS:

two coins

DESCRIPTION:

During the mating season (March - June), some birds can be called close enough to easily observe them.

1. Sora rail, gallinules and other swamp and reed birds can be called by sitting behind a bush and holding one coin and hitting it with the other coin sharply about five times. Pause and continue. After five minutes, move on if no bird is seen.
2. To call many song birds as well as starlings, grackles and cowbirds, cup your hands and with your mouth make a sound similar to pp-shh about five or six times. Pause and do it again. This will call many types of birds during the breeding season.



TITLE: Don't Junk It

LEVEL: Middle School

OBJECTIVE:

The students will create and construct a product from a solid waste item.

MATERIALS:

list materials the students can obtain

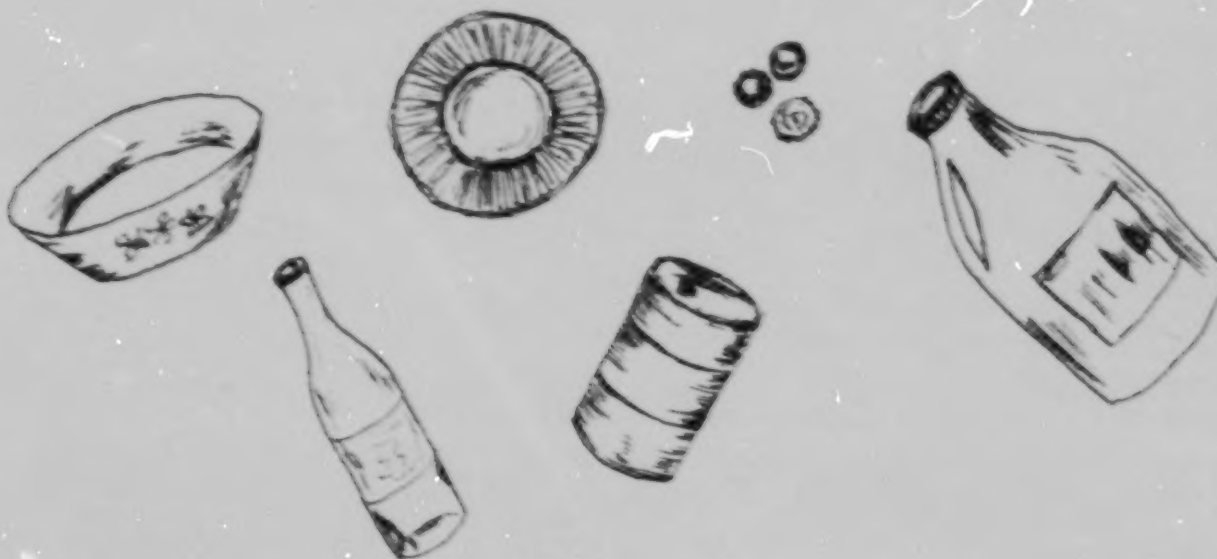
DESCRIPTION:

The students are given a list of common household solid waste items such as bottles, caps, plastics - categorized into three or four groups.

The student is to select at least one item from each category and create a functional product from it.

The student will then present his creation to the class in a "show and tell" type of situation.

The students will discuss the problems centering around the disposal of solid waste: pollution of air, soil and water; continuation of the "Cornucopia of Supply" concept.



TITLE: Respiration of Leaves

LEVEL: Middle School

OBJECTIVE:

To understand the respiration of leaves and that a broad leaf will absorb and lose more moisture from the air than a needle type leaf.

MATERIALS:

balance or accurate scale calibrated in grams
deciduous and evergreen leaves and needles

DESCRIPTION:

With scale or balance, find a leaf and pine needle of equal weight. Immerse leaf in a petri dish of water and food coloring for one hour. Then weigh the leaves again to see that the broad leaf has absorbed more moisture. Put the leaves on the sunny windowsill for one hour. Weigh the leaves again to check for water loss.

Vocabulary: respiration-osmosis

RELATED ACTIVITIES:

Immerse cut flower into a container of water and food coloring. Observe how the plant absorbs the colored water.

Examine leaves under microscope to observe stoma and leaf veins.



TITLE: Organic Gardening
Composting - Quick Method

LEVEL: Middle School

OBJECTIVE:

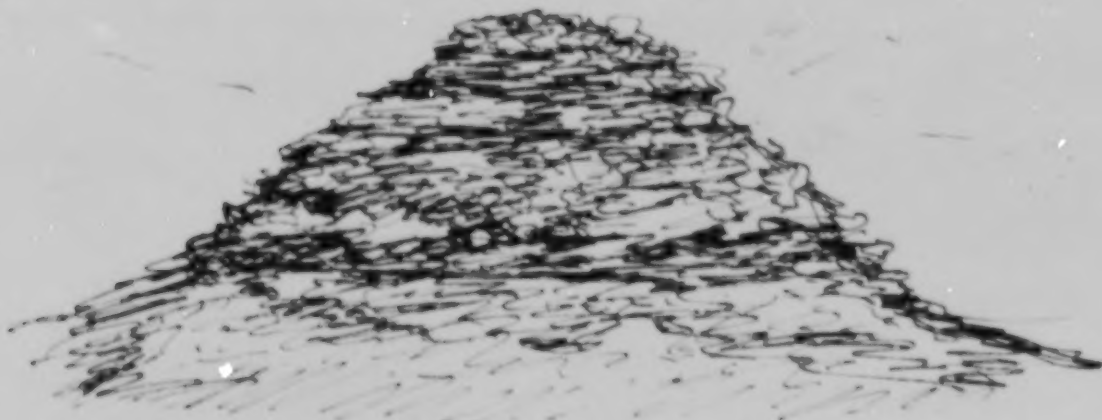
To teach the concept of recycling organic materials to provide rich humus to be used as a fertilizer in the garden.

MATERIALS:

shovel
organic materials

DESCRIPTION:

First, scratch up some bare soil and build your pile in layers on the bare spot. Start with plant matter, such as grass clippings, leaves, weeds, hay, vegetable scraps from the kitchen, etc. Then add nitrogen-rich materials such as any livestock manure, poultry wastes, cottonseed or soybean meal, hair from the barber shop, etc. (these should equal about a fifth of the green matter). Add a half-inch layer of soil and repeat layers until three or more feet high. Other good materials in smaller quantities are wood ash, green sand, rock phosphate, and crushed limestone. Keep moist but not wet and turn every week. In warm weather you will have compost within a few weeks.



TITLE: Mapping Survey of Area to
Chart Small Animal Activity

LEVEL: Middle School

OBJECTIVE:

To learn more about the habitat and activities of small animals (mice, etc.).

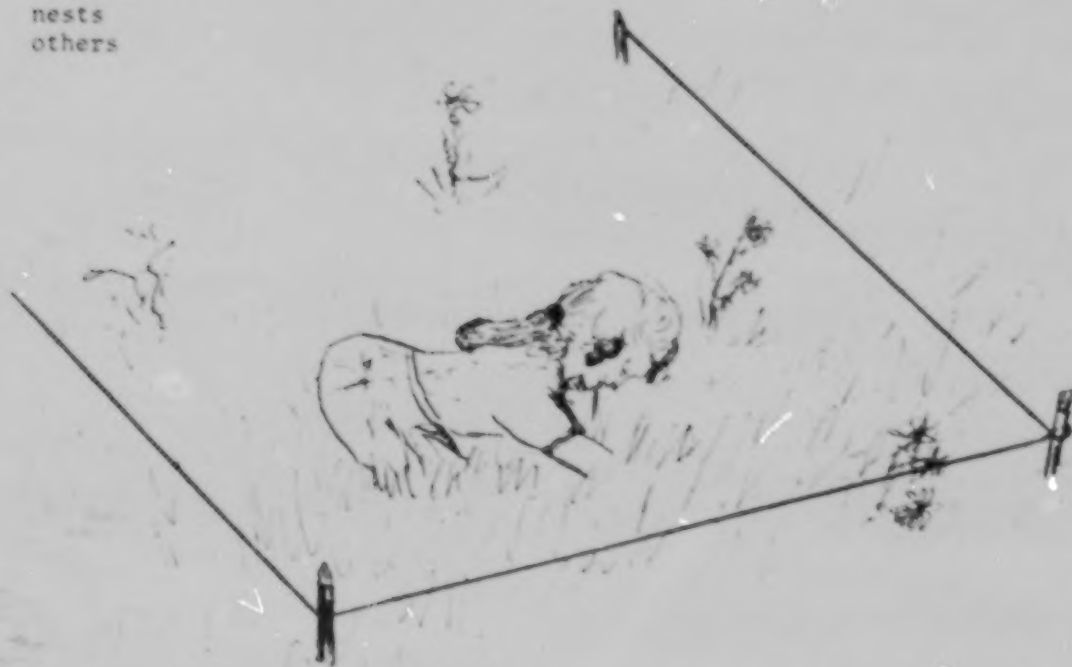
MATERIALS:

yardstick
meter stick
rag strips
chart paper

DESCRIPTION:

Select an area where the grass is thick. Walk in the study area as little as possible. Measure out a square where each side is 4 yards or 4 meters long. Mark the corners of the study area with rags tied to a weed. Go through the area on hands and knees in search of small runways. Work across the square, exposing all runways. Chart all things observed. Include:

runways
droppings
cuttings
resting places (wide areas in runways)
burrows
nests
others



TITLE: Dip and Strike Measurement

LEVEL: Middle School

OBJECTIVE:

Students will measure the dip and strike of the rock outcrops on the school grounds.

MATERIALS:

Brunton Cadet Compass or similar field compass

DESCRIPTION:

Place Brunton Cadet Compass flat on the rock outcrop.

DIP--the angle of dip is measured in degrees to the horizontal.

Brunton Cadet Compass



STRIKE--when Brunton Cadet Compass is held parallel to the plane of the horizontal, the bubble will be centered. With the bubble centered, hold the compass against the rock outcrop and the compass reading will be the direction of strike, for example, 45° or north-east.



The symbol for dip and strike is " $\perp$ ".

The perpendicular portion represents the direction of dip and the horizontal portion represents the direction of strike.

TITLE: Organic Gardening--Praying Mantis for
Biological Insect Control

LEVEL: Middle School

OBJECTIVE:

To teach the students how nature has its own method of control.

MATERIALS:

praying mantis egg cases

DESCRIPTION:

Of the 86,000 recorded insects found in the United States, about 76,000 are considered "beneficial" to man. These insects prey upon other insects for food and, in some instances, for a "home" in which to complete their life cycle. This is nature's way of controlling the insect world. Without this built-in control, insects would have conquered the world long ago.

The female mantis forms a "house" for her eggs by issuing a foam-like substance which hardens and acts as a home for the 100 to 400 eggs. Nature has provided the eggs with a "built-in" time control. They won't hatch until the weather has warmed and there is insect food available. If egg cases are purchased, they should be enclosed in a small mesh bag and tied to a tree twig or weed stalk or pass a needle and thread through the outer 1/4 inch of the egg case and tie to a twig or reed. These "Nature's Mastodons" (bug eaters) have an appetite that is hard to satisfy.



TITLE: It's a Tree State

LEVEL: Middle School

OBJECTIVE:

The students will become familiar with native and non-native trees in Michigan.

NATIVE TREES

Balsam Fir	Green Ash	Black Cherry
Black Maple	Blue Ash	Black Oak
Red Maple	White Ash	Burr Oak
Silver Maple	Honey Locust	Chestnut Oak
Sugar Maple	Black Locust	Chinquapin Oak
Buckeye	Black Walnut	Northern Red Oak
Paper Birch	Butternut	Pin Oak
Black Birch	Red Cedar	Scarlet Oak
Yellow Birch	Eastern Larch	Shumard Oak
Bitternut Hickory	Black Gum	Swamp White Oak
Mockernut Hickory	Tulip Poplar	White Oak
Pignut Hickory	Black Spruce	Hills Oak
Shagbark Hickory	Eastern White Pine	Jack Oak
Shellbark Hickory	Jack Pine	Shingle Oak
Hackberry	Red Pine	Black Willow
White Cedar	Sycamore	White Willow
Flowering Dogwood	Balsam Poplar	Weeping Willow
American Beech	Big Tooth Aspen	Sassafras
Black Ash	Trembling Aspen	Basswood
Swamp Cottonwood	Eastern Cottonwood	Eastern Hemlock
Red Elm	Ironwood	American Elm
Blue Beech	Paw Paw	Rock Elm
June Berry	Red Bud	Pin Cherry
Choke Cherry	American Chestnut	

NON-NATIVE SPECIES

Scotch Pine	Douglas Fir	Box Elder
Austrian Pine	Colorado Blue Spruce	Osage Orange
Virginia Pine	Norway Spruce	Magnolia
Ponderosa Pine	Gray Birch	Chinese Elm
European Larch	White Poplar	Tree of Heaven
		Ginko

TITLE: Constructing a Hypsometer

LEVEL: Middle School

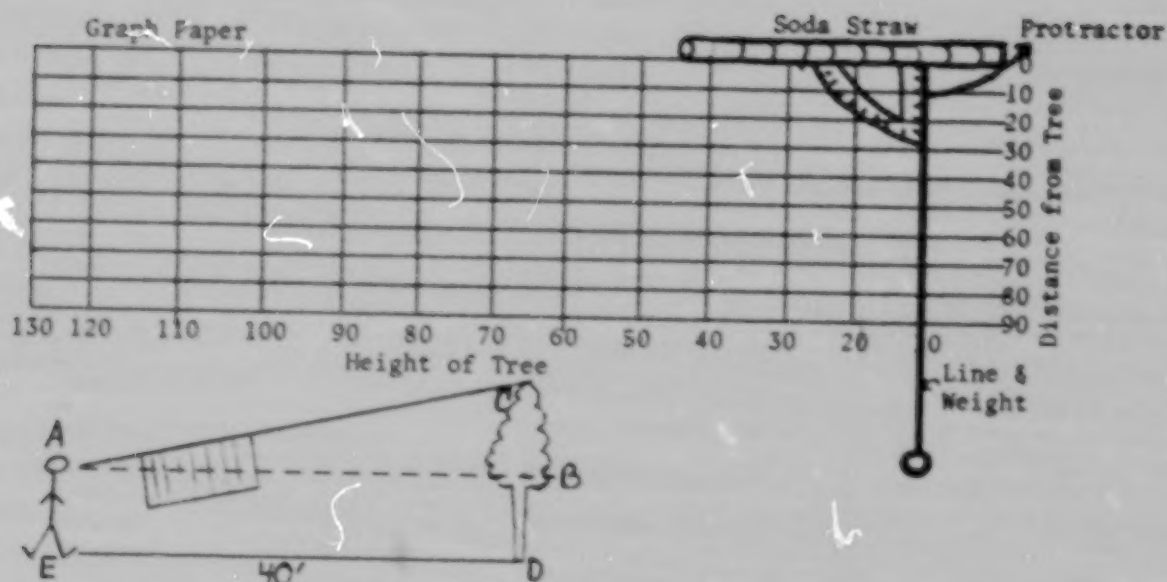
OBJECTIVE:

The student will construct a hypsometer to measure the height of trees.

MATERIALS:

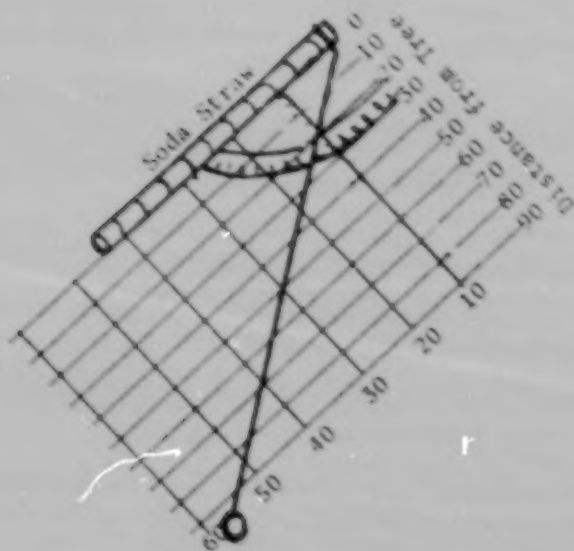
soda straw
protractor
graph paper
stiff cardboard or masonite (11 x 16 inches)
string
metal washer for weight

DESCRIPTION:



Sight through the straw to the top of the tree. A person 5 feet tall has paced or measured 40 feet from the trunk of the tree and is standing at point E. He sights the top of the tree, point C, through the hypsometer and sees that the line with the weight on the end falls in the following manner.

Constructing a Hypsometer (Continued)



By looking at the point of intersection of the 40' line (distance from tree) and the plumb line, he can read the height of the tree along the bottom scale. This is 40' in our example. Remember, however, that the line of sight is about 5' above the ground because the person is 5' tall. Hence, he needs to add this 5' to his measurement, so he says that the height of the tree is approximately 45'.

TITLE: Noise: You Hear Only What You
Want To Hear

LEVEL: Middle School

OBJECTIVE:

To make the students aware of noise pollution and possible solutions.

MATERIALS:

tape recorder
magazine articles
newspaper

paper
pencil

DESCRIPTION:

A. Investigate four different environments. List every possible sound that you can hear in: a quiet area, downtown city (inside buildings and on the street); a home (inside and outside); industrial area (inside and outside if possible). For each environment put the sounds you listed or heard on tape recorder into one of four categories: 1) men, women and children's voices and sounds; 2) animals, insects and natural sounds; 3) motorized vehicles and machines; 4) man-made sound carriers. Then answer the questions: Which sounds would you consider NOISE? In which area would you like to spend most of your time?

B. Get a tape recorder with fresh batteries and set the volume control halfway between loud and soft. Always record at the same volume. Also try to record at the same distance from each sound source. Record many different sounds and rank them from very loud to very soft. On a map of your area of investigation, plot the areas of highest recorded noise pollution. What are the sources of most of the NOISE?

RELATED ACTIVITIES:

Write to the Department of Health, Education and Welfare, The Environmental Protection Agency and Bureau of Standards in Washington, D.C. Find out what is being done about NOISE POLLUTION by these federal governmental agencies.

TITLE: A Dandy Lion Study

LEVEL: Middle School

OBJECTIVE:

The students will take a close look at a common plant and its characteristics. This is a lesson in observation.

MATERIALS:

digging tool
hand lens
measuring tool

plastic baggie
1 or more complete dandelion plants
(including roots, flower, bud, seeds)

DESCRIPTION:

1. Describe the habitat.
2. What type of soil?
3. Is the soil moist, wet or dry?
4. Is the blossom open? Why or why not?
5. Count the number of dandelions within the radius of one meter of your plant. Compare the density with five other areas. How do you account for the differences?
6. Look down at the plant. On the back of this sheet, sketch the arrangement of the leaves. What is the arrangement called? Advantages?
7. Look for any signs of life under the leaves. Did you find any? If so, what?
8. How many leaves are on your plant? Compare with five others. Where is the shortest leaf located? Why? Where is the longest leaf located? Why? Are there any dead or brown leaves? If so, where and why? Are there any signs of leaf diseases?
9. Sketch a leaf on the back of this sheet. Label the parts. Where is the widest part of the leaf? Why? Pick off each leaf and arrange in order of size. What is the average length? Are there any two leaves alike on your plant? Does this have any significance? What are the functions of the leaf to the plant?
10. How many flower heads are on your plant? How long is the flower stem? Color? Is it hollow? Do you see anything on the edge of the broken flower stem? Describe it. Is the stem fuzzy or smooth?

A Dandy Lion Study (Continued)

11. What is the function of the flower stem? Sketch the flower head and label the parts. Take the flower head apart. How many separate flowers are there? Do they all look alike? Look at one flower under the lens. Sketch and label the parts. How many stamens? pistils? petals? sepals? How many buds on the plant?
12. How is the flower pollinated? Self? How many seed heads are on your plant? How long is the stem? How does it compare with the flower head stem? Why the difference?
13. Approximately how many seeds in the head? How does this compare with the number of flowers in the head? Sketch a seed. How is it dispersed? What is the function of the seed?
14. How long is the stem from where the leaves end to the beginning of the side roots? Why is this an advantage to the plant? What is its function?
15. Dig up as much of the root as you can. How long was it? What kind of a root is it? Are there secondary roots? Cut the root transversely. Sketch and label what you see. Cut the root longitudinally. Sketch what you see. How does it taste? What is the function of the root?

TITLE: Nuts to You

LEVEL: Middle School

OBJECTIVE:

To learn the names of trees that produce nuts.

DESCRIPTION:

1. What nut is a nickname given to a president? (Hickory)
2. What nut is the color of an eye? (Hazel)
3. Where do we like to go on a hot day? (Beech)
4. What nut is a trunk or a box? (Chestnut)
5. What nut is a popular winter beverage? (Coconut)
6. What nut is a spring vegetable? (Peanut)
7. What nut is a South American Country? (Brazil)
8. What nut is a penalty for wearing tight shoes? (Acorn)
9. What nut is a barrier? (Walnut)
10. What nut is made out of cream? (Butternut)

RELATED ACTIVITIES:

English: think of more to add to the nutty quiz



TITLE: Rock Outcrops on the School Site

LEVEL: Middle School

OBJECTIVE:

The students will construct a rock outcrop on the school site and will solve problems in field geology, related to the outcrop.

MATERIALS:

600# of sandstone (SS) slabs

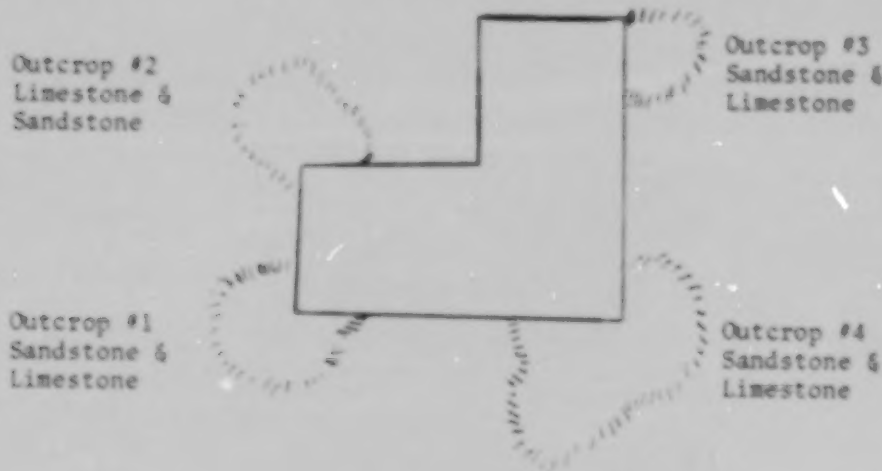
600# of limestone (LS) slabs

(Can be acquired from a building supplier or landscape architect-- see if student's parents may help.)

The slabs should be at least 2 feet long and have a flat surface. Shovels are also needed for digging.

DESCRIPTION:

At four locations selected to enhance the attractiveness of the school site, dig a hole deep enough to bury the rock slabs with at least one foot yet visible. The four sets of sandstone - limestone units should be tied into one geological structure; i.e., a dome, basin or fault. The structure described here is a dome:



- | | |
|-------------|-------------------------------------|
| Outcrop #1* | Dip 30°
Strike 225° or southwest |
| Outcrop #2 | Dip 37°
Strike 310° or northwest |
| Outcrop #3 | Dip 42°
Strike 45° or northeast |
| Outcrop #4 | Dip 23°
Strike 135° or southeast |

TITLE: For the Birds

LEVEL: Middle School

OBJECTIVE:

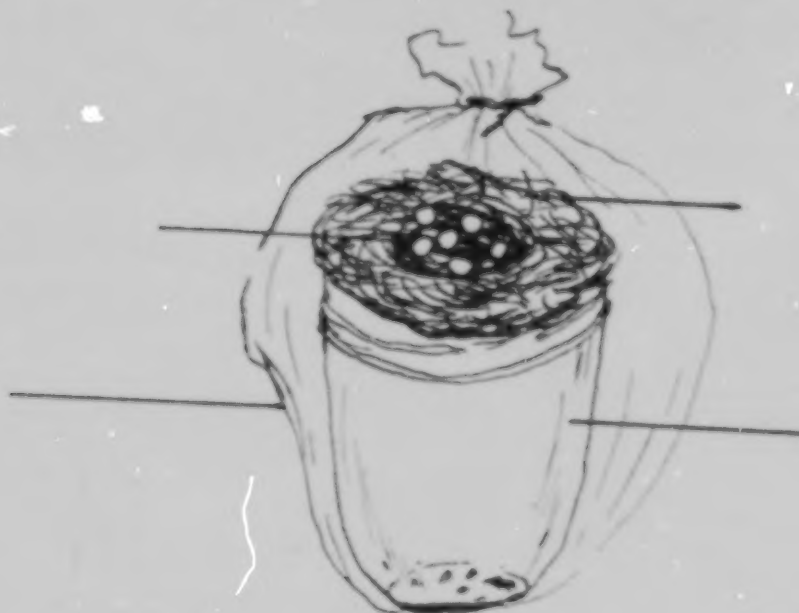
The learner is to observe and identify insects and larva that nest in a bird's nest

MATERIALS:

wide mouth jar or milk jug with top cut off
alcohol
cotton swabs or tweezers
plastic bag
moth balls
rubber band or string

DESCRIPTION:

Have the students bring in bird nests in the fall or winter. Place the nest on the top of the jar or jug and add moth balls. Cover with a plastic bag and fasten firmly. Fumes will force the insects and larva to the bottom of the jar. Remove and place them into alcohol.



TITLE: Where Do You Live, Bug?

LEVEL: Middle School

OBJECTIVE:

The students will discover that members of the insect families can live in a multitude of habitats.

MATERIALS:

small containers with lids
trowels

DESCRIPTION:

Select a spot where a class can explore for insect habitats. Excellent areas include edges of fields with access to woods, or a shrubby area or mowed and unmowed areas.

Put a time limit of 10-15 minutes on collecting so that you will have enough time to discuss the finds and discover what types of insects have been collected.

Explain that students should look in, on and under.

Report finds: If small group, allow each to describe what and where of exploration; if large group, form smaller groups--collect data and give group reports.

Make a tabulated chart of where each was found--in, on or under. Where were most located? Where was evident variation in species? Total numbers collected? What was the average number per hunter? If time had been doubled, would totals have doubled? What factors might have affected the results? (limited area, fatigue) What other types of creatures share the insect habitat? What relationship may exist among the animals in a single habitat? Which are herbivorous? Carnivorous?

RELATED ACTIVITIES:

In a terrarium, place samples of plants, insects and other small animals from one of the habitats explored.

Watch where each of the animals stay most of the time.

Is the place related to the survival of the animal?

TITLE: Construction of Glacial Landforms

LEVEL: Middle School

OBJECTIVE:

The students will construct six glacial land forms and compare them to similar structures near the school.

MATERIALS:

sand or dirt (sandbox may be suitable)

DESCRIPTION:

Each of the landforms except the kettle will be at least 2 feet high. These are the 6 basic landforms that compose most of the topography for the lower peninsula of Michigan. Following is a picture and description of each of the 6 landforms.

1. Esker: A small winding hill (20 by 30 ft. long) which is formed from sand and gravel being deposited by a stream flowing under or through a glacier.
2. Kame: A high mound (8 feet in diameter) of sorted material deposited in a hole which developed in the glacier or at the bottom of a waterfall in the glacier.
3. Kettle: A depression or swampy area found in flat fields which has resulted from an ice block being buried under the glacial fill by the glacier and the soil collapses as the ice block melts.
4. Drumlin: A land form resembling the underside of a spoon. It was formed as the glacier encountered an obstacle which it rose over and tapered off as the resistance decreased.
5. Terminal Moraine: A hill of unsorted material resulting from a glacier whose rate of flow is equivalent to its rate of retreat. The various materials carried by the glacier are then deposited in one arc shaped hill.
6. Outwash Plain: A delta shaped hill formed as materials were deposited by water flowing from the front of the melting glacier.

TITLE: Spore Prints

LEVEL: Middle School

OBJECTIVE:

The students will observe the life span of mushrooms and become aware of intricacy and beauty in nature's simple forms. They will derive a joy from this beauty.

MATERIALS:

mushrooms
cardboard
mucilage

glass bowl
toothpicks
small corks

DESCRIPTION:

During the mushroom's short life span, spores by the millions drop from its gills. Catch the spores as they fall, for they create an interesting and beautiful pattern. Great care is needed in doing this since the slightest draft sends the microscopic spores flying.

Mucilage Method: Spread a very thin coat of mucilage and water mixed half and half, over a piece of thin cardboard. Cut the stem of a mature, fully-opened mushroom directly under the cap. Place the cap bottom down in the middle of the cardboard. To suspend, push three toothpicks into the cap and support it on small wood or cork blocks. Cover with a glass bowl and leave it undisturbed for twenty-four hours. Lift the cap off and let sheet dry in the air.

Colors of spores vary from white to pink and rusty-brown to black.

No mushroom has blue spores, so to have your spores show up well, use a medium blue paper for your spore prints.

RELATED ACTIVITIES:

Laminate and frame the spore prints.

TITLE: Show and Tell: Snow's Different

LEVEL: Middle School

OBJECTIVE:

To study amount of pollutants in the snow and the amount of water content, etc.

MATERIALS:

cans
snow

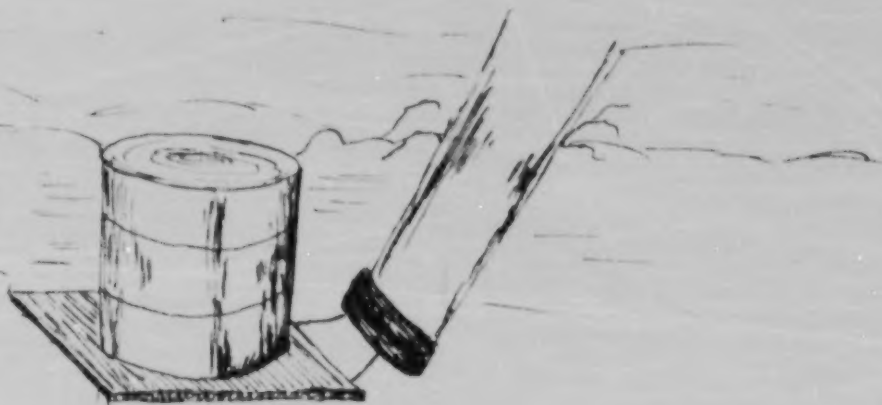
DESCRIPTION:

Remove the top and bottom of a straight-sided can. Push the can straight down into the snow until its rim is flush with the snow surface. Reach under the can and by hand or with a piece of cardboard, cut the snow even with the bottom edge of the can. Remove the cylinder of snow with your hand or cardboard and slide off any heaping snow on the top. Dump this snow into a can whose bottom is intact. Take samples of different types of snow found in places such as: beside buildings, plowed from a parking lot, drift in an open area, etc.

Melt the snow and measure the water. Put the water through a filter to determine the amount of pollutants.

RELATED ACTIVITIES:

Mathematics: figuring the percentage of water in a given amount of snow



TITLE: Outdoor Good Manners

LEVEL: Middle School

OBJECTIVE:

Factors to be considered before collecting wild plant material should be made clear to all students.

DESCRIPTION:

1. Pick only with a purpose.
2. Take the plant only when and where it is abundant.
3. Take only what you actually need, can transport, and care for.
4. Keep flowers fresh and moist after picking.
5. Make sure you know and can identify the plants that are protected by law.
6. If you wish to go on private property, obtain owner's permission beforehand.
7. Use clippers and/or knife when gathering flowers.
8. Use a camera. "It is better to take nothing but pictures and leave nothing but footprints."
9. Always leave enough blossoms to develop seeds for future plants.
10. Before disturbing any plant, consider its many values in nature -- particularly in the situation where found. Is it a ground cover? Food or cover for wildlife? Just for beautification? What relation does it have to other plants?
11. When plants are about to be destroyed in any area, secure permission from the owner to transplant them.
12. Remember to:
 - a. Take plenty of soil to protect the roots.
 - b. Plant in the same kind of setting or habitat.
 - c. If possible, transplant in early spring or after seeds ripen.

Enjoy, Not Destroy, So Others May Also Enjoy!

TRILLIUMS



TRAILING ARBUTUS



TITLE: Yesterday--How Does It Relate To Today? LEVEL: Middle School
-or-
Backyard Archaeology

OBJECTIVE:

The students will develop skills such as: grid-mapping, record-keeping, data-collecting, archaeological techniques, analysis and interpretation of cultural development.

MATERIALS:

for mapping:

2 ft. pointed stakes (number needed varies with size of area to be surface mapped)
heavy cord to be marked at regular intervals
graph paper
pencils

for the "dig":

wheelbarrows
shovels
trowels
assortment of dime store paint brushes, 2" to 1/2" wide
old dental tools (see your favorite dentist)
orange sticks
paper bags
marking pens
log book
cardboard cartons to store and carry "loot"
turkey wing feathers
camera

DESCRIPTION:

With or without students, locate a site which shows promise. Surface artifacts are invariably the best clues. Make necessary arrangements with owner of property to excavate.

A daily log should include daily activities, materials found and even drawings.

Before any excavating is begun, a surface map should be made. This can be done by using a simple grid. Set up a base line near one side of the work area. Make sure that the line is straight, easy to work from and will not be disturbed by any digging. From this base line set up secondary base lines, encompassing the area to be excavated. Cross lines extending from the marked points on the cord will complete the grid. (Illustration on following page.)

Yesterday--How Does It Relate To Today? (Continued)
-or-
Backyard Archaeology

Base line

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

GRID

Use of brushes and small tools are invaluable for this purpose.

The surface map should include any surface artifacts, trees, shrubs or other inclusions. Grid maps should be made at regular intervals. Dirt should be excavated uniformly.

Pitting is to be discouraged! Remove dirt by wheel barrow to an area convenient to, but not at the edge of, the "dig". Artifacts should be numbered and sacked. Each bag is marked with the artifact number, level or depth found and the grid number.

Profiles of the sides of the excavation can be gridded and mapped. Photographs are invaluable additions to the records.

In the laboratory, artifacts should be cleaned and classified.

All data should be compiled with reference to location in the site, type, abundance and comparison with similar articles in use at present.

RELATED ACTIVITIES:

Soil studies can be made of the trench profiles.

Creative writing: report of the "Dig"

Interpretations of today and yesteryear.

TITLE: Living Things: Necessities of Survival LEVEL: Middle School

OBJECTIVE:

The students will describe the four factors necessary for the survival of living things.

MATERIALS:

plants grown from seed in the classroom
freezer or cold area (below freezing)

DESCRIPTION:

Four things are necessary for all living things to survive.

1. Food--animals eat various kinds of food, plant or animal. Demonstrate this by letting seeds sprout on blotting paper and do not transplant them vs. seeds planted in potting soil to which plant food supplement has been added. Note that plants get their food from the soil through their roots vs. animals mouths.
2. Water--demonstrate this by depriving a plant of water until it dies.
3. Sun-heat--demonstrate by depriving a plant of light until it dies and putting another one in the freezer.
4. Reproduce--observe plant seeds, cut them apart to show the new seeds. Observe fish or reptile eggs (or filmstrips, pictures, etc. of them); observe animal young. Note that each species will reproduce its own kind, but different species will reproduce in a different manner.

It is not plausible or humane to conduct the plant experiments with animals, so the transfer of learning to the animal kingdom must be done abstractly.

TITLE: Tree Ring Rubbings--How To Record Tree Rings

LEVEL: Middle School

OBJECTIVE:

The students will study tree rings to record the story of growth.

MATERIALS:

roll of adding machine paper
thumb tacks
soft lead pencil

DESCRIPTION:

Locate a stump and roll out paper over the smoothest and longest diameter. Double over the ends of paper twice and tack it to the bark. Hold your pencil almost parallel with the surface of the stump. Rub nearly at right angles to the annual rings as you would in getting a rubbing of a penny. Work from outer edge to center.

You now have a complete record of the tree's lateral growth. The accuracy of your record will be improved by slipping a postcard under the paper tape and with a sharp pencil, mark the outer edge of each tenth ring from the year the tree was cut till you come to the center. Along the unmarked edge of your strip write the location of the tree stump and of other large neighboring trees, the species, slope and altitude.

Old house or barn timbers may be rubbed the same way and possibly cross-dated with the oldest tree stumps or correlated with records of local weather notes from a library, museum or historical society.

Local museums and/or antique shops often have actual cross sections of old logs which might be used for both rubbing and dating.



TITLE: Can Can: Any Can Can Be A Snow Can

LEVEL: Middle School

OBJECTIVE:

To learn to measure another form of precipitation and the variability of fall over a given area.

MATERIALS:

3# coffee can or can of similar size
masking tape
stake

DESCRIPTION:

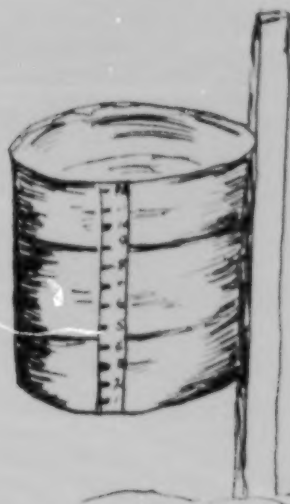
Mark masking tape with felt tip waterproof pen in inches and half inches. Beginning at the bottom of the can, attach it securely. Fasten the can to a stake so it will not overturn or blow away.

Place gauge outside away from the buildings and trees. Check the amount of snow after each snowfall. Record and compare with the weather bureau's reports. Empty each time so it is ready for the next snowfall.

Prepare ten or more gauges to establish snowfall over a large area. Each child could have one at his home and records could be kept on a school district basis.

RELATED ACTIVITIES:

Mathematics: prepare accurate charts; after snow season make graphs for each month on the amount of snowfall at each location



TITLE: Indicator of Environmental Quality:
Bird Life

LEVEL: Middle School

OBJECTIVE:

Students will list characteristics of their environment and will rate the environmental quality as poor, fair, good or excellent.

MATERIALS:

Bird Life--An Indicator of Environmental Quality, (available from the Cooperative Extension Service, Pasadena Avenue)
binoculars
any good bird books

DESCRIPTION:

The scale is based on the number of different species of birds observed so it is necessary to list them.

After their rating is completed, devise a plan for habitat improvement that will attract a greater variety of bird species. The plan should fit the existing situation rather than necessitate the removal of vegetation already there.

RELATED ACTIVITIES:

air pollution field studies
pesticides--effect on environmental quality
science in city and suburb
habitat improvement for wildlife
bird watching



TITLE: Organic Gardening - Mulching

LEVEL: Middle School

OBJECTIVE:

To teach students a way of preventing unwanted weeds from growing in the school garden, and a way of conserving moisture and keeping the soil in good, friable condition. This will also prevent soil erosion on sloping land and protect plants in the wintertime.

MATERIALS:

spoiled hay
newspapers
straw
compost
weeds

DESCRIPTION:

Mulching is dressing the soil around your plants with organic matter. This keeps moisture in, weeds down, adds nutrients and humus to the soil, feeds the bacteria that feed your plants, and makes gardening a lot easier. There is one danger to mulching. In very moist soils, mulching should be delayed in order to avoid "damping off" which is caused by a fungus which develops in a very moist, poorly ventilated soil. This disease will cause up to 90% fatality in plants afflicted.



TITLE: How do the Chemicals in Detergents
Affect Plant Life?

LEVEL: Middle School

OBJECTIVE:

Students become aware, through observation, of pollution caused by detergents.

MATERIALS:

pond plants such as duckweed, etc.
three equal-sized glass jars containing gravel and water (same amount of each in all three jars)
1 teaspoon of solid potassium phosphate
1 teaspoon of solid ammonium nitrate

DESCRIPTION:

Set up the three identical aquaria. Be sure to place the same amount of water and gravel in each as well as the same number of plants (no animals). Place each aquarium in the same window so each gets the same light. Add 1/2 teaspoon of ammonium nitrate to one jar. Add 1/2 teaspoon of potassium phosphate to the second. Do not add any chemical to the third jar as it will be the control.

Examine the aquaria each day to note any changes in plant life. Keep a diary of your observations. After 3 or 4 days add another 1/2 teaspoon of each chemical. Compare the two aquaria with the control and describe the differences that you see after 4 or 5 weeks.

RELATED ACTIVITIES:

Find out which detergents affect plant growth the most.

What local bodies of water have excessive growth of algae? What might this indicate about the water?

TITLE: How to Classify Plants or Animals

LEVEL: Middle School

OBJECTIVE:

To understand that living things can be classified (grouped) in several different ways and that some ways are better than others.

MATERIALS:

25-30 buttons of various sizes, colors, types, shapes, types of attachments, etc.

paper
pencil
baggies

DESCRIPTION:

Place a student with a work partner. Prepare small baggies filled with buttons for each group. Have the children list all the ways these buttons can be classified, recording the number of buttons that fit into each group. Children are amazed that there are so many different kinds of buttons. Most of them have never taken a good look at a button before!

Then discuss how animals are grouped because of common characteristics. The cat family is a good group to begin with because most students are familiar with them. The rodent family is more diversified and makes an interesting study.

RELATED ACTIVITIES:

Classify all the people in the classroom.



TITLE: Snowflakes

LEVEL: Middle School

OBJECTIVE:

To teach students to appreciate the beauty of snow and to study the formation of ice crystals.

MATERIALS:

glass slides or piece of glass
clear plastic or lacquer spray
cardboard
magnifiers

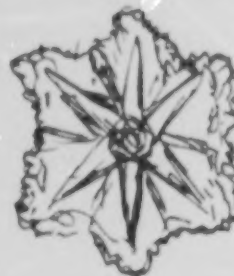
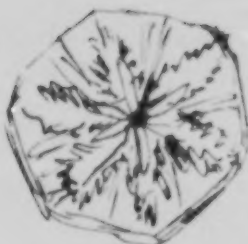
DESCRIPTION:

Store the slides and lacquer in the freezing compartment of the refrigerator. When it is snowing, take the slides outdoors. Don't let them warm up! Spray a thin coat of clear lacquer on each slide. Hold the slide so a few flakes fall on it. Leave the slide outside one hour for drying. Bring into lab and examine them with a hand lense or microscope.

Preservation of Snowflakes with Formvar: This technique is a bit more complex but more exact. Formvar is soluble in chloroform. A 2-ounce package may be obtained by sending \$1.00 to "Snowflake", Monsanto Chemical Company, P.O. Box 2130, Springfield, Mass. 01101. A drop of solution is placed on a slide; a snowflake is transferred from a black cloth to the slide. The solution hardens, preserving the flake.

RELATED ACTIVITIES:

Art: Create designs for textiles, wallpaper, carpets, place mats and ever so many other things



TITLE: Camera Points

LEVEL: Middle School

OBJECTIVE:

The students will have experience in photographing outdoor areas.

MATERIALS:

camera (classroom camera may be borrowed from Project CHANGE,
Genesee Intermediate School District)
film (color or black and white)

DESCRIPTION:

Examples of areas to visit for photographing animals are:

Flushing Park

For-Mar Nature Center

Hog Backs

Mott Children's Farm

Camp Copneconic



TITLE: River Activity

LEVEL: Middle School

OBJECTIVE:

The student is to collect and identify at least 5 insects and other animals found in the river water.

MATERIALS:

dipping net (kitchen strainer)
coffee can or other container

DESCRIPTION:

The students are taken to a river or stream. This activity requires wading in the water with dip net in hand. Dip the net into the muddy bottom to obtain specimens. Place mud on the ground and sort for dragonfly nymph and other animals. Place specimens in container. Research and identification can be done in the classroom. Pick up stones four to five inches or larger in diameter and turn over to find the "home" of the caddis fly larva. Remove and place in container. Be sure to observe the water surface for any insects that may be found and collect these also.

RELATED ACTIVITIES:

Make illustrations of insects and animals found. Identify and research each specimen. Describe and illustrate the life cycles of specimens that have stages of development.



TITLE: Organic Gardening -
Ladybugs for Biological Insect Control

LEVEL: Middle School

OBJECTIVE:

To understand how ladybugs help control harmful insects and observe their beneficial habits.

MATERIALS:

Purchase some ladybugs or observe them in the outdoor lab.

DESCRIPTION:

Ladybugs eat aphids, other insects, eggs and larvae. They do not eat plants. When you see ladybugs on your plants, they are busy eating other insects. Aphids are their main diet. Never kill a ladybug! It is one of the best friends you ever had for your crops, your garden, and insurance that your crop will not be destroyed by insects. They are Nature's way of helping you control insect pests.

Use of Nature's own method, ladybugs, is the lowest cost of insect control in existence. There are about 74,000 ladybugs in a gallon. Soon after being released the females begin laying eggs, up to 1000 per season. Eggs hatch in 7 to 10 days. Both larvae and adults have ravenous appetites.

For students use at home:

1. an average garden - 1 quart
2. large garden plus a few fruit trees, berries, and shrubs - 1 gallon
3. Release ladybugs in a series starting when insect pests appear, adding more as needed for control. Keep surplus ladybugs in refrigerator. They hibernate at 40° and will remain so for a long time.



TITLE: A Rotten Log As A Community

LEVEL: Middle School

OBJECTIVE:

To show that a rotten log is a community of plants and animals that live in a unique environment.

MATERIALS:

1 rotten log
hand lens

DESCRIPTION:

Locate a rotten or rotting log. Have the children guess what might be found. Carefully turn the log over and have a recorder make a list of all the animal life that is present. If the bark is still intact, carefully lift and note pupas, larva, insects, seeds, etc.

Sometimes plants can be found growing from crevices. Let the children think how the seeds got there and why the plants could grow. List what is necessary for a plant to grow.

Discuss how our environment is made up of many kinds of communities of plants and animals, dependent upon each other.

List other animals that may visit the log, but not be a specific member of the community. (snake curled up at the base, bird looking for insects, etc.)

RELATED ACTIVITIES:

Study two communities, such as a small town and a city. Show how each is dependent upon the other.



TITLE: Water: What It Can Do

LEVEL: Middle School

OBJECTIVE:

To show various ways that water moves and deposits soil to make new land forms.

MATERIALS:

filmstrip: "How Water Changes Land"
creek or drain

vocabulary words: undercut (undermine), alluvial fan, ox-bow, gully, deposition, island, sand or gravel bar and others that may be in the filmstrip

DESCRIPTION:

First show the filmstrip to acquaint the class with ways that water makes changes. Discuss the terms used.

Take the class to a stream or gully and have them identify the various terms and examples given in the filmstrip in "their own backyard." Be sure to indicate how a stream deposits soil on the inside of a curve and undermines the opposite bank. Also indicate places of rapidly moving and slow moving water and why. It could be due to uneven bottom, amount of fall or debris in the bottom.

RELATED ACTIVITIES:

Discuss the social aspect of moving soil. Who is losing it? Who is gaining land (topsoil)? During high water or in flood stages, amount of silt deposited in streets, stores, homes, causes extensive damage, inconvenience, besides loss of soil from its former location.

TITLE: Comparison of Air Temperatures Above
Land and Above Water

LEVEL: Middle School

OBJECTIVE:

The students will learn how land and water influences air temperatures.

MATERIALS:

2 pans
2 thermometers
string or rubber bands

DESCRIPTION:

Put some soil into a pan and a like amount of water into a second pan. Attach a thermometer over each container so it can measure the temperature of the air just above the soil and above the water. Place both pans in the direct sunlight. Record both temperatures every 10 minutes.

Put both pans in the shade. Record both temperatures every 10 minutes.

How does the difference in temperatures lead to air movements? Which movement can be called a sea breeze? land breeze?

What happens to smoke, dust and particles in the air when there is a wind? What happens to smoke, dust and particles in the air when there is no wind?

RELATED ACTIVITIES:

Recreation and Health: Why does it always feel cooler at the beach? Is the air cleaner near the beach? Which cools off faster, the land or water? Why does it feel warmer at night when you swim?

TITLE: Organic Gardening--Companion Planting...
Using Herbs

LEVEL: Middle School

OBJECTIVE:

The students will understand the concept that certain plants and herbs will repel harmful insects.

MATERIALS:

area for outdoor lab which would contain the following plants:
marigolds, nasturtiums, etc.

DESCRIPTION:

Students may set up plots with plants to make the observations and crush the plant parts between their fingers to detect with their nose why these plants repel insects.

<u>Herb</u>	<u>Influence</u>
Borage	Deters tomato worm
Catnip	Deters flea beetle
Dead Nettle	Deters potato bug
Garlic	Deters Japanese beetle
Horseradish	Deters potato bug
Henbit	General insect repellent
Hyssop	Deters cabbage moth
Marigolds	Plant throughout garden Deters Mexican bean beetle, nematodes and other insects
Mole plant	Deters moles and mice
Castor bean plant	Deters moles
Nasturtium	Plant under fruit trees to deter aphids. Also deters squash bugs and striped pumpkin beetle.
Pot Marigold	Deters Asparagus beetle, tomato worm and general garden pests
Peppermint	Repels cabbage butterfly
Rosemary	Deters cabbage moth, bean beetle and carrot fly
Rue	Deters Japanese beetle

Other good plants to have: sage, summer savory, yarrow, tansy, tarragon, thyme and valerian.

TITLE: Strip Tease or Cover It Up
(Stop Soil Erosion)

LEVEL: Middle School

OBJECTIVE:

The students will learn that soil cover affects the amount of soil loss.

MATERIALS:

- 2 wooden boxes (20" long, 10" wide and 4" deep)
- 1 gallon watering can
- 2 quart jars or cut off gallon size plastic milk containers

DESCRIPTION:

Make a spout on the wooden boxes to extend beyond the box by about 2 inches. This can be made with several layers of foil or pieces from a tin can.

Cut a piece of sod (from an area that will not be damaged) the size of one box. Trim vegetation to height of 1" to make it easier to handle. Fill the other box with bare soil from the same place. Place the boxes on a table so that the spouts extend over the edge.

Raise the other end of the boxes by sliding a length of wood 1" thick under them. Set the bottles under the spouts so that they can catch any water that runs out of the boxes.

Put 2 quarts of water in the watering can and then pour the water on one of the boxes at the end farthest from the bottle. Repeat this with the other box. Be careful to pour the water on both boxes at the same time, in the same way and from the same height.

Questions:

1. How long does it take for water to start dripping from the spouts?
2. What is the amount of water collected in each bottle?
3. How long does it take for water to stop dripping from the spouts?
4. What is the clarity of the water in each bottle?
5. Filter the water from the bottles to find the quantity of soil that eroded from each box.

RELATED ACTIVITIES:

Try this with different kinds of soil and different kinds of cover. How can this information be useful to the person who has a hillside lot and has been experiencing a drainage or erosion problem? Is this always related to farming? Notice new construction of highways, sewers, waterlines, utilities, shopping centers, subdivisions and their erosion problems? What fast-growing crop could be planted to stop erosion?

TITLE: Air Pollution In Your District

LEVEL: Middle School

OBJECTIVE:

The students will locate areas of greatest air pollution from natural or man-made sources.

MATERIALS:

large map of school district
map pins
vaseline
kleenex

alcohol
test tubes
filter paper
glass slides or 3x5 cards with
a drop of salad oil

DESCRIPTION:

The students make a large map of the school district locating where they live with black-headed map pins.

Give each child a glass slide with a smear of vaseline on it. Wrap it carefully in tissue. If enough slides are available, use two for each child. The slides are placed on a window sill or railing at the front and back of their home. If slides are not used, use cards and anchor securely.

After one week bring the slide wrapped in tissue to school. Remove the material with alcohol and put it through filter paper. Identify the particles found. Use a series of colored map pins to indicate seriousness of particulate (air-borne particles) pollution: red, severe; yellow, moderate; blue, little or none.

If part of the district is near industry, identification may be made as to whether the pollution is industry or natural. Farm or rural areas which have bare soil due to building and development will have natural pollution due to wind-blown soil.

RELATED ACTIVITIES:

The students can study the diseases caused by air pollution and the influence of pollution on plants.

TITLE: Candid Camera

LEVEL: Middle School

OBJECTIVE:

The student will record evidence and categorize different examples of pollution through visual discrimination.

MATERIALS:

8mm camera (or slides)
portable tape recorder

DESCRIPTION:

Begin with a discussion of different kinds of pollution: air, water, noise, and people.

With parents and camera equipment, break into small groups. The class then tours the community close to the school. Evidence of pollution is recorded on the tape recorder and film.

After the film is developed and brought back to the classroom, discuss what pollution has done to their community. Identify the types of pollution seen in various camera shots.

RELATED ACTIVITIES:

Language Arts: write letters to corporations in the community to ask about pollution controls they are practicing

Resource People: invite pollution control experts in the classroom

Articles: clip articles from newspapers and magazines

Investigation: other forms of filming techniques, animation, etc.

Determine projects to preserve local ecology.

Involve community agencies.

Map Skills: record on a map the pollution areas that were found

TITLE: Park Planners--A Student Involvement Activity

LEVEL: Middle
School

OBJECTIVE:

The students will be involved in using specific math, science and language arts skills in working with others in a realistic, practical experience.

MATERIALS:

master plan of the school site

DESCRIPTION:

The students will be involved in school park planning.

1. Each class can be divided into small groups corresponding to the different parts to be included in the park. (nature area, play area, etc.)

2. Groups proceed to research and study their particular areas. They would list:

- a. items to be placed in the area
- b. map locations of items
- c. cost of various items in the area

3. Student groups report to the total group on their recommendations.

4. Group recommendations are then collected and utilized in final park plans.

RELATED ACTIVITIES:

Math: mapping skills, pricing

Language Arts: oral and written reports

Art: drawing plans for park

Research: finding out about other parks

Field Trip: parks, nature centers

Building: table top models of park

Resource People: parks and recreation people, architects to discuss the model

TITLE: Annual Rainfall--On the School Site

LEVEL: Middle School

OBJECTIVE:

To find out how much rain water falls on the school site each year.

MATERIALS:

measuring tape or blueprint of the school site

DESCRIPTION:

Find out the average annual rainfall in your area. Consult the local weather bureau or The World Almanac.

Equation for finding gallons of rainfall on the site per year:

$$\frac{\text{Av. rainfall (in/yr)}}{12 \text{ (in/ft)}} \times \text{area (in sq. ft.)} \times \frac{7.5 \text{ gal.}}{1 \text{ cu. ft.}} = \begin{array}{l} \text{gallons} \\ \text{of rain-} \\ \text{fall on} \\ \text{site per} \\ \text{year} \end{array}$$

sample problem: average rainfall is 36"
area of school site is 250,000 sq. ft.

$$\frac{36'' \text{ per year}}{12'' \text{ per ft.}} \times 250,000 \text{ sq. ft.} \times \frac{7.5 \text{ gal.}}{1 \text{ cu. ft.}} = \begin{array}{l} 5,625,000 \text{ gallons} \\ \text{per year} \end{array}$$

RELATED ACTIVITIES:

How much run-off from the school site is there each year? If 3/4 or 75% of the site is covered by buildings and paving, then $0.75 \times 5,625,000$ gallons = 4,218,750 gallons per year of run-off.

TITLE: Tracks You Can Take With You

LEVEL: Middle School

OBJECTIVE:

The students will make a permanent record of animal tracks for study or hobby.

MATERIALS:

plaster of paris
tin can
strips of flexible material
water

small paint brush
pieces of wire
vinegar

DESCRIPTION:

1. Carry plaster in a container that can be tightly sealed.
2. Find suitable track in the mud.
3. Place a strip of a flexible material around the track so that it forms a ring or collar.
4. Place plaster in the tin can and add water gradually. Practice will determine correct proportions. A thick paste sets at once. A thinner paste allows more time to work and will enter all crevices of the track as it should. (The addition of vinegar to the paste will delay hardening.)
5. Pour the plaster into a mold. Wait 10 or more minutes until the plaster is hard.
6. Remove collar and gently pick up the cast. Brush off dirt and gently "wash" later. It is also possible to cast several tracks or two sets of four to show the stride or jump. In order to give support to a large cast, add pieces of wire while the plaster is still soft. If an impression of the track is desired (as seen in the mud) a casting of the original cast is feasible.
7. Tracks in the snow:
 - a. Spray the track surface with water from an atomizer to coat the track with ice.
 - b. Add snow to the plaster of paris to lower the temperature of the paste so the track will not melt.
 - c. Don't give up - try again!

TITLE: The Flintstones and Their Rock Pile
or
Chip off the Old Block

LEVEL: Middle School

OBJECTIVE:

The students will investigate the various stages of rock succession.

MATERIALS:

an area containing rocks in various stages of succession

NOTE: Succession is somewhat orderly change from those organisms which occupy bare rock to those which need a bit of soil, to those who need more soil. Pioneer communities, comprised of plants and animals, are the first to occupy sites where nothing has ever grown. Initially no soil exists on primary sites. As soil develops, there is a gradual change from one community to another.

DESCRIPTION:

1. Identify the following stages of succession:
 - a. bare rock
 - b. rock colonized by lichens
 - c. rock colonized by lichens and mosses
 - d. depression in rock where soil has accumulated allowing plants to take root
 - e. rock covered by a thin layer of soil with plant cover
 - f. rock with deeper soil layer allowing woody or desert or prairie plants to become established
2. As succession proceeds, what can you say about:
 - a. the complexity of the communities
 - b. the species diversity
 - c. the density of the species
3. As succession proceeds, are you able to visually determine if there is an increase or decrease in total mass of living organisms and organic matter accumulation.
4. How do you think this increase or decrease in question 3 will affect the consumers (e.g., mice, rabbits, hawks)?

RELATED ACTIVITIES:

Compare the bare rock to a street in a downtown area of a large city and progress to the farmlands surrounding the city.

TITLE: Word Puzzle: Environmental Terms

LEVEL: Middle School

OBJECTIVE:

Students will circle environmental terms.

MATERIALS:

pen or pencil

DESCRIPTION:

EOORGANICCLASSROOMDDT
TOPSOILPHOSPHATEFODH
ABIODEGRADABLEXTCS
LRESIDUEWILDLIFE
SOTGZOXENVIRONMENTAL
ITOUNRECYCLINGBNGRYT
GARBAGEOHIKENAUZEALH
EEEEYTASLIOSCOCRYSSAB
LRSDUNPOLLUTIONMTHRI
SAOARIOGBIROSMIEIUUO
UTULECUYSPOREPNCOGTL
MIRETURNABLEDOGANELO
UOSLUDGEWASTEPAPERUG
HNEXERCISEERPTEGERCI
BERKMINSECTICIDEDAYIC
TNEGRETEDOORKNOBIBTA
UONFERTILIZEREBSOXRRL
RUBBAGEPESTICIDEDDEOR
FIREERUNAMAOFORYTSHE
DISPOSABLECOMPOSTREC

TITLE: Tree Teaser

LEVEL: Middle School

OBJECTIVE:

To learn the names of trees by playing a game.

DESCRIPTION:

1. What tree remains after a fire? (Ash)
2. What trees are part of your face? (Tulips)
3. What tree is well-groomed? (Spruce)
4. What tree is used by fortune tellers? (Pine)
5. What tree has given a nickname to a famous American general?
(Hickory)
6. What tree has the same name as an officer of a church? (Elder)
7. What tree wastes away in grief? (Pine)
8. What tree sounds like a personal pronoun? (Yew)
9. What trees stick together? (Gum)
10. What trees wear an animal's coat? (Fir)
11. What tree provides a place to swim? (Beech)
12. What tree has the loudest bark? (Dogwood)
13. What tree has a cat in it? (Catalpa)
14. What tree has an ear in it? (Pear)
15. What tree is best liked? (Poplar)

RELATED ACTIVITIES:

English: make up more questions

TITLE: Soil: A Living Community

LEVEL: Middle School

OBJECTIVE:

To understand that topsoil is a living environment.

MATERIALS:

12" sq. paper
trowel or small shovel
cardboard box
newspapers

petri dishes or other small glass dishes
baggies
sterilized (boiled) sliced potato

DESCRIPTION:

Have the children work in groups of 2, 3, or 4. Use the paper to measure a square foot of topsoil. Lay the paper on a grassy area and dig down 2 to 4" keeping the material removed as compact as possible. Put into a cardboard box.

Spread newspapers and put material from the box on it. Begin to separate items found into some order, such as:

- a. all green plant material
- b. all dead or rotting plant material
- c. dead or rotting animal material
- d. stones (rocks)
- e. living animals (ants, larvae)
- f. seeds
- g. eggs (ant, insect)
- h. soil (sand, clay, loam)

Some of this material can then be sprinkled on a piece of boiled potato. Put it in a petri dish and in a few days various colonies of molds will appear.

A follow-up study can be made on how plants use decomposed materials and what happens to dead leaves, branches, plants, animal life.

RELATED ACTIVITIES:

Plants and animals found in the topsoil are dependent upon each other just as we are. A social studies project on how each person is dependent upon others in our society can be undertaken.

TITLE: Splash! Splash! How High Does
A Raindrop Splash?

LEVEL: Middle School

OBJECTIVE:

To observe the force of raindrops on a grassy area, sandy area, garden (growing) area, shoulder of a road and a parking lot.

MATERIALS:

light-colored construction paper
three or four milk cartons
stones
elastic bands
magnetic compass

DESCRIPTION:

1. Fold the construction paper around the milk carton so that all four sides are covered and use the elastic bands to hold it in place.
2. Place some stones in the bottom of each carton to act as a weight or anchor.
3. Mark N, S, E, W on top of each side.
4. Place the splash pillars outdoors in the areas suggested in the problem. If possible, they should be put out at the beginning, middle and end of a rainstorm. New construction paper would have to be put on the splash pillar each time. Position the splash pillars in a N, S, E, W direction by using the compass.

The splash pillars shouldn't remain outdoors during the entire storm, only long enough to obtain some splash records. If left out too long, the rain could wet all the paper erasing the splash marks.

Mount the actual construction paper used on larger sheets of paper and make comparisons.

Questions:

1. On which splash pillar was there the least amount of mud?
2. In which area were the mud splashes the highest?
3. On which side of the splash pillar were the greatest number of marks or splashes?
4. What factors influence the amount and height of the splashes?
5. Of what value would this information be to soil scientists?
6. How can you use this information at home?
7. What could be planted under the eaves to keep the side of your house from becoming mud-spattered?

TITLE: Rotten Log Projects

LEVEL: Middle School

OBJECTIVE:

To observe a micro-environment at various seasons of the year to compare the activity and kinds of animals and plant life.

MATERIALS:

rotten log or dead elm that you are relatively sure will be available through a change of seasons

DESCRIPTION:

Determine the following information about your log:

1. Species of tree from which log came.
2. Location of log; i.e., slope.
3. Amount of rainfall in a year in the area.
4. How did the tree die--natural causes, diseases, logging?
5. Approximately how long has the tree been dead?
6. How old was it when it died?
7. Is the bark still on the log or tree?
8. Is the inside firm or rotten?
9. Is the wood dry or moist and what effect does this have on the decay process?
10. List animals seen in or on the log.
11. List plants seen in or on the log.

RELATED ACTIVITIES:

Discuss influences of physical factors such as moisture and temperature on the life of the log.

Note the color of mosses and lichens that have been covered by snow as compared to those that have not.

TITLE: Be a Detective: Can You Tell
Which Animal Made These Tracks?

LEVEL: Middle School

OBJECTIVE:

The students will observe animal tracks in the snow and draw some conclusions about the animal.

MATERIALS:

rulers
fresh snow in nearby field or woods
handout chart
paper
pencil

DESCRIPTION:

1. Find a fresh set of animal tracks in the snow.
2. Measure the distance between each set of tracks.
3. Measure the depth of tracks in the snow.
4. Make a scale drawing of the track for later use.
5. Put findings on the chart.

Animal	Distance Between Each Set of Tracks	Depth of Tracks	Location	Characteristics of animal such as: feeding, scat, drawings
1.	1.	1.	1.	1.
	2.	2.	2.	2.
	3.	3.	3.	3.

Questions or Discussion:

1. What were the animals you studied?
2. Find the meaning of the word "habitat".
3. Did any animals stop to browse along the way?
4. How large do you think the animals were? Why?

TITLE: Yes, You Can Measure the Size of a Raindrop! LEVEL: Middle School

OBJECTIVE:

To measure the size of raindrops and keep them as a collection. They may be collected in various places such as an open area, under a tree, near a wall of a building, under a bush, etc. Compare the sizes.

MATERIALS:

flour sifter	pie plates
lid of a shoe box	ruler
two pounds finely sifted flour	newspaper

DESCRIPTION:

1. Fill the lid of the shoe box with the flour until it is level with the top edge of the lid.
2. Use the ruler to smooth the surface of the flour until it is flat and level.
3. Place a piece of newspaper over the flour for protection against rain while carrying the device to and from the desired area.

On a rainy day or during a rainstorm, take your covered raindrop collector outside. Remove the newspaper cover for a couple seconds and let the rain hit the flour, then cover it and return indoors.

Allow the raindrops in the flour to dry out and become hard.

Once the pellets have dried, use the flour sifter to sift out the pellets. How do the raindrop pellets compare with each other? With those collected from various places?

These can be glued in order of size onto a strip of black construction paper.

RELATED ACTIVITIES:

Find out when the largest raindrops occur -- at the beginning, middle or end of a storm

TITLE: Snow's White--What If It Were Black?

LEVEL: Middle School

OBJECTIVE:

The students will be able to observe and record the rate of different colors of objects melting into the snow.

MATERIALS:

handout

rulers

objects of different colors, uniform in shape and size (e.g., floor tiles)

thermometers (optional)

snow

DESCRIPTION:

1. Find a clear, flat area with evenly distributed snow.
2. Place several objects into the snow about 12" apart. Set the objects carefully into the snow. Don't push them in.
3. Leave objects until tomorrow and measure with a ruler the distance each object melted into the snow.
4. Record the temperature of each object. (optional)
5. Put the results on the chart below; list each object, its color, depth it melted, temperature, etc.

OBJECT	COLOR	DEPTH IT MELTED	TEMPERATURE
1.			
2.			
3.			

- a. Graph the depth each object melted with its color.
- b. Graph each color with temperature and melting depth with relation to color.

Follow-up questions:

1. Which colors settled the most? Why?
2. Which colors settled the least? Why?
3. List as many factors as you can that might have influenced the ability of the object to melt the snow.
4. Does the reflection of the sun on the snow and object have any influence on how far the objects melted into the snow?

TITLE: City Trees

LEVEL: Middle School

OBJECTIVE:

Urban students learn that certain trees can do well in the city under adverse conditions.

MATERIALS:

a city block or park
tree identification book
camera, if available

paper
pencil

DESCRIPTION:

Draw a map of the area to be studied and label main items: streets, stores, etc. Indicate on map trees to be identified, etc.

- a. Characteristics: before identifying the trees, take time to examine their characteristics. Forms and kinds of trees vary with the environment. (soil, temperature, water, air quality)
 1. How large are the trees? (height, size of crown, girth of trunk, diameter)
 2. Are they deciduous or evergreen?
 3. How much bare ground surrounds the base of the tree?
 4. Estimate the amount of water available to soak into the soil near the tree per year. (average annual rainfall times area)
 5. What other sources of water does the tree have? Find two or more trees of the same kind which show different conditions of health. Try to account for the differences you see. For example, trees in the park may appear healthier than trees of the same species along the street.
- b. Identification:
 1. Find out what kinds of trees are in the area.
 2. Try to learn from local parks department when they were planted and why these kinds were chosen. Perhaps they occurred naturally and were protected.
 3. Use reference books to find out more about each kind of tree. If it is not native to your region, what are its origins? What characteristics enable it to survive where it does?
 4. Is this tree a good or poor "street tree"? Is it able to remain healthy in the city environment?

RELATED ACTIVITIES:

List ways trees are helpful to you as an individual.

TITLE: Making An Herbarium

LEVEL: Middle School

OBJECTIVE:

To teach the students to make a plant collection.

MATERIALS:

plastic bag
magazine or plant press

labels
paper for mounting specimens
scotch tape

DESCRIPTION:

Plants to be collected: Leaves of native Michigan broadleaf trees and late summer wild flowers that are in bloom. (Garden flowers, house plants, and imported ornamental shrubs and plants do not count!)

Method of collecting specimens: Short class field trips, longer field trips after school, and students are encouraged to make personal field trips on weekends or when an opportunity arises. Specimens may be kept in a moist plastic bag or placed directly into an old telephone book or thick magazine as they are collected. Be sure to keep a record of the date, locality and habitat where plants were collected.

Method of preserving plants: Plants should be placed in an old telephone book, thick magazine or plant press for pressing and drying. Care should be taken in pressing specimens to show full details of flowers and leaves of specimens. Drying time required is normally 2 to 3 weeks. If the specimen has been identified, keep a slip of paper with it containing the name of the plant to help later on when labeling the mounted specimens.

Mounting dried specimens in the herbarium: After the plants are thoroughly dry, use scotch tape to affix one specimen to each page of the herbarium. Center the specimens on the page as best you can being sure to leave plenty of room in the lower right hand corner for labeling.

Labeling specimens: Six things must be described for each specimen and in the following order:

- 1) Common Name
- 2) Genus Name
- 3) Locality where collected
- 4) Date plant was collected
- 5) Habitat where collected, such as swamp, lowland woods, upland woods, bog, roadside, vacant field, stream bank, fence row, etc.
- 6) Name of collector--you will be the collector, unless someone gives you a plant which they collected from another area, then you must record their name.

TITLE: Tree Height Estimation

LEVEL: Middle School

OBJECTIVE:

The students will understand the principle of similar triangles to estimate the height of trees.

MATERIALS:

yardstick or meter stick

DESCRIPTION:

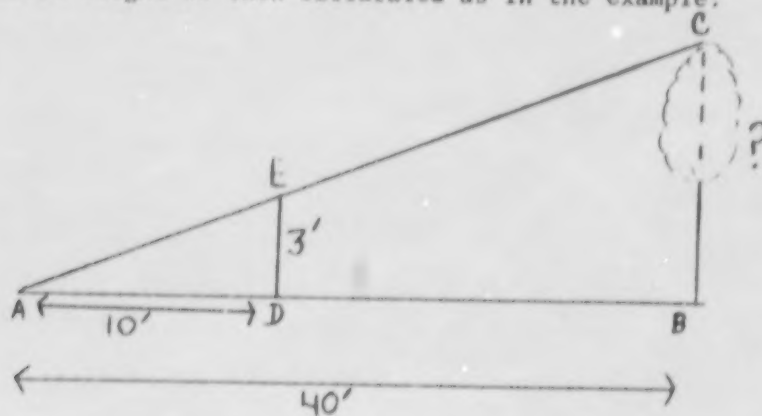
Have the student lie on the ground at point A and sight to the top of the yardstick (or meter stick) to the top of the tree. Distances are recorded and the estimated height is then calculated as in the example:

$$\frac{\overline{CB}}{\overline{AB}} = \frac{\overline{ED}}{\overline{AD}}$$

$$\frac{\overline{CB}}{40} = \frac{3}{10}$$

$$10 \overline{CB} = 120$$

$$\overline{CB} = 12 \text{ feet}$$



NOTE: Each student needs a partner to work with him on this activity.

TITLE: Hidden Trees

LEVEL: Middle School

OBJECTIVE:

The students will enjoy learning about trees.

MATERIALS:

puzzle
pencil

DESCRIPTION:

M	A	S	H	I
U	P	B	D	L
O	L	E	A	B
M	H	C	R	I
W	E	Y	F	G

The above box is a forest and you are to stroll around in it and name the trees you find there. The forester has planted more than twenty kinds of trees. You can find these names by starting with any letter and moving to any adjoining letter in any direction (up, down, across or diagonally) to spell a tree's name. No box may be skipped, but a letter may be repeated as often as needed. For example, find "C" and spell "cherry".

RELATED ACTIVITIES:

Develop puzzles using shrubs, bushes, other plants, flowers, etc.

TITLE: How Does Wind Velocity Affect
Temperature? How Chilly is it?

LEVEL: Middle School

OBJECTIVE:

To learn that there is a difference between actual temperature and the degree of coldness that is felt due to wind speed.

MATERIALS:

box
two thermometers
anemometer (or call weather bureau to get wind speed)

DESCRIPTION:

Obtain wind speed. Tape one thermometer to the outside of a cardboard box so that it is in the wind. The second thermometer can be taped inside the box so that it is sheltered from the wind. Compare the temperatures shown by the thermometers.

Repeat the experiment when winds of different velocities are blowing.

The degree to which a wind appears to lower the air temperature is referred to as the wind chill factor.

WIND CHILL CHART

Thermometer Readings in Degrees Fahrenheit

Wind Speed in MPH	Thermometer Readings in Degrees Fahrenheit														
	30	35	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40
10	20	14	8	2	-4	-10	-15	-21	-27	-33	-39	-45	-50	-56	-62
15	13	7	0	-6	-12	-18	-25	-31	-38	-44	-50	-55	-63	-69	-75
20	9	2	-5	-12	-19	-25	-32	-39	-45	-52	-59	-66	-72	-79	-85
25	5	-2	-9	-17	-24	-30	-37	-44	-51	-58	-65	-72	-78	-86	-93
30	3	-5	-12	-20	-27	-33	-41	-48	-55	-63	-70	-77	-83	-91	-98
35	0	-7	-14	-22	-29	-36	-44	-51	-58	-66	-73	-81	-87	-95	-102
40	-1	-9	-16	-24	-31	-38	-46	-53	-61	-69	-76	-84	-91	-98	-105

RELATED ACTIVITIES:

Have a discussion on how the wind affects us in our everyday life and the type of clothing that is needed when there is a wind chill factor involved.

TITLE: Up With The Birds!

LEVEL: Middle School

OBJECTIVE:

The students will visit a variety of bird habitats. Quietly!

MATERIALS:

binoculars
notepad and pencils

DESCRIPTION:

Extending the concept: The following things may happen as a result of a "bird walk".

1. Recognizing a variety of birds by appearance and song.
2. Making a bird clue chart--how birds differ.
3. Developing bird feeders, observable from the classroom, to attract birds to school grounds; supplemental feeding.
4. Taping sounds of birds.
5. Relationship between beaks and food eaten by types of birds.
6. Creative activities motivated by "bird hikes"; e.g., poems, stories, sketches, paintings and sculptures.
7. Interested students could continue taking "bird hikes" at a variety of times during the year; possibly join the Junior Audubon Society, etc.
8. Which birds are now listed as endangered species? Research why and what is being done to protect these birds.
9. Math related activities are: a) size - smallest and largest birds, interesting statistics, b) surveys - birds students like best and types of habitats, and c) graphs related to outdoor visits.
10. Resource people are taxidermist, 4-H staff, and a bird watcher.
11. Additional field trips: museum and other nature areas.

Up With The Birds! (Continued)

RELATED ACTIVITIES:

Places to write.....

Audubon Naturalist Society
8940 Jones Mill Road
Washington, D.C. 20015

National Wildlife Federation
1412 16th Street
Washington, D.C. 20036

Northeastern Bird Banding Association
c/o Audubon Society

Michigan Audubon Society
7000 North Westnedge
Kalamazoo, Michigan 49007

A good source.....

Birds, Examining Your Environment
Mime Publications
25 Groveland Terrace
Minneapolis, Minnesota 55403

TITLE: Nature's Fertilizer Factories for
the Organic Gardener

LEVEL: Middle School

OBJECTIVE:

To teach the students the value of earthworms for creating the rich topsoil which supplies us with most of our food.

MATERIALS:

boxes, 14 x 18 x 8 inches deep
earthworms
well-rotted manure, leaf mold, peat and soil

DESCRIPTION:

For fun, profit, soil building, a hobby, business, raising the lowly earthworm can be exciting, enjoyable, profitable and just plain good old-fashioned fun. They can be sold locally or by mail order throughout the U.S.A. as fish bait, breeder stock, experimentation, orchardist (for placement under their fruit trees) and teachers (for classroom study).

Earthworms may be raised inside or outside, in boxes or beds, in winter or summer, cold climate or warm.

Propagation and growth will be at their best if the temperature is maintained between 65 and 75 degrees. At lower temperatures, they become more sluggish with corresponding lessening in egg capsules. Higher temperatures may cause them to move away from the bed or burrow deep to escape the heat. Again, they may easily be killed with high heat as in the case of applying a thick layer of freshly cut grass clippings to the bed. The rapid rise in temperature to as much as 140° literally cooks them.

If box culture is to be followed, make boxes 14 x 18 x 8 inches deep. Nail a short piece of 1 x 2 on each end, near top center (for hand hold). Also nail 14 inch 1 x 2 on the bottom, about 3 inches from each end. This will allow any heat that may be generated to dissipate.

BEDDING MATERIAL: one part, well-rotted manure, leaf mold, peat and 3 or 4 handfuls of soil. (A mixture of leaves, well-dried grass clippings with a small amount of soil has proven to work well.) Fill boxes 6 inches deep. Water well and let set for about 2 weeks. This will allow any heat that may be generated to dissipate.

Stock each box with 400 to 500 breeder size worms. Top feed with

Nature's Fertilizer Factories for the Organic Gardener (Continued)

a light sprinkling of corn meal, egg mash, cottonseed meal, or other suitable meal, (the worms should clean up the feed in 24 to 48 hours), and sprinkle lightly with water. Replace feed as often as necessary but do not use too much because it becomes sour.

Keep the culture boxes in a garage, basement, or other suitable indoor room. At no time allow the bedding material to freeze. Water often enough to maintain proper amount of moisture.

TITLE: Micro-Succession in Rotting Logs

LEVEL: High School

OBJECTIVE:

To observe and describe the micro-succession of rotting logs.

MATERIALS:

samples of logs at different stages of decay

DESCRIPTION:

Locate a standing dead tree, a log which is rotting on the inside but firm on the outside and a log completely rotten. During the winter season, you can collect large chunks of each and bring them indoors for study.

To study the succession from dead tree stage to where the log becomes part of the forest floor, ask observation-directed questions such as: Is there any bark on the tree? Is it easily removed? Is the wood hard or dry? Are there animals or animal traces present? Break a piece off. What does it look like on the inside? What does it smell like? What is the biggest difference between all three samples? Which stages had the most animal traces? Were there any plant traces (fungi)? What is their part in rotting log succession?

You can collect the insects in separate containers---if you did the study on log samples taken indoors. Then you can count the numbers and variety per successional stage for comparison.

If you find a log with lichen on it, you have an excellent example of primary succession (in theory) and can bring that concept out. Also the concept of decomposers fits here.



TITLE: Natural Selection of Work:
A Field of Competition

LEVEL: High School

OBJECTIVE:

To demonstrate the process of natural selection.

MATERIALS:

3 x 5 index cards cut into identical puzzles for as many students as you have in class

DESCRIPTION:

This lab experience is a "tournament" to decide which student in class can put a simple puzzle together in the shortest time. Run a series of contests, using the same puzzle. The ability to improve the skill involved in putting the puzzle together will play an important part in determining who will be the winner. In each series of contests it is the least skilled that are eliminated but the process continues through many series of contests. In the end, it is the most skilled that survives. It is much the same among living organisms in nature.

Procedure: Students will contest in pairs. As many pairs may contest at one time as there are umpires to watch them. Students who are not contesting at a particular time may serve as umpires. In each contest, the student who gets through the puzzle first is the winner.

Each student will contest three times in each series of trials. For the first trial, the pairs numbered 1,2,3,4,5,6,7,8 and following will contest. For the second trial, numbers 1,3,2,4,5,7,6,8 and following will contest. For the third trial, numbers 1,4,2,3,5,8,6,7 and following will contest. Students losing all three of the contests will retire from the game.

The numbers should be collected at this point. The remaining students who are still in the game will draw new numbers in a series beginning with 1. They will repeat the process each contesting three times in the same numerical order as before, using the same puzzle. Again three-time losers will retire from the game.

Additional contests following the same pattern will continue until all students except one have been eliminated. This remaining student will be declared the winner of the tournament.

RELATED ACTIVITIES:

Generate a class discussion about how this experience is like selection in nature. Discuss the changing environment.

TITLE: Fungus Among Us

LEVEL: High School

OBJECTIVE:

To study reproduction of the mushroom.

MATERIALS:

fresh mushroom
sheet of white paper
glass tumbler
small brush
glycerine and water solution

microscope slide
cover glass
compound microscope
knife

DESCRIPTION:

Each student is to go out into the field and collect a mushroom. Bring it back to the lab and examine.

The mushroom itself is the fruiting body of this particular fungus. It consists of a stalk and umbrella-like cap. Look at the underside of the cap and find the gills. Cut the cap from the stalk and put it gill side down on a piece of white paper. Cover the cap with a tumbler or some other object that will protect it from air currents. Set the cap, paper and tumbler in a place where it will not be disturbed. The next day uncover and remove the cap by lifting it straight up from the paper.

1. What do you observe on the paper?
2. What is the relation between what you see on the paper and the structure of the mushroom cap? With a small, damp brush, remove some of the material on the paper and place it on a microscope slide. Add a drop of glycerine and water solution. Examine under both low and high power.
3. Approximately how many particles are there in the sample you are observing?
4. Using this number, estimate the total number of such particles coming from the mushroom.
5. If we assume that these particles are reproductive spores, how could you account for the fact that the world is not covered with mushrooms?
6. How numerous would mushrooms be if they only produced a small fraction of the number of spores seen here?

TITLE: Frog Mounting

LEVEL: High School

OBJECTIVE:

The students will understand the mounting technique as demonstrated by the teacher.

MATERIALS:

frog
tweezers
formaldehyde
borax

clay
wire
pins

DESCRIPTION:

With tweezers, take the insides of the frog out of the mouth. Bring the legs through the mouth inverting them to the heel until the whole frog is inside out. Let it set in formaldehyde overnight or rub borax into the skin (be generous). Turn right side out and start to fill with clay (even fill the eye cavity for a button or piece of glass will be used to fill it). When nearly full, you may insert some wires to give support and also for insertion into a base of wood (to hold the mount and to set the desired position). Set eyelids with pins and let them dry for a couple of days. Pull out pins and you are finished.

RELATED ACTIVITIES:

Language: description of mounting



TITLE: Soil Pollution: Nutrient Deficiency

LEVEL: High School

OBJECTIVE:

To test soil for fertility.

MATERIALS:

soil testing kit
soil samples from suggested areas or field trip to such areas

DESCRIPTION:

Soil pollution--field trip--point out the importance of lichen and mosses. Collect these from almost bare soil.

Collect soil samples and test soil for nutritive value for plants. Point out the importance of soil supporting some type of vegetation.

Find eroded area, point out how it happened and how this problem could be corrected. Find a small drainage area and point out the importance of plants to insure proper drainage. Find a farm using contour farming practices and explain the importance of this type of farming.

RELATED ACTIVITIES:

Also consider trips to wild land to observe conservation practices on other than farm land.

TITLE: Design-----> A Cell

LEVEL: High School

OBJECTIVE:

To observe, create, appreciate, interrelate skills and life-style.

MATERIALS:

microscopes
slides of prepared or living cells

DESCRIPTION:

Student first familiarizes himself with structure of a particular cell, makes accurate drawing. Task: to create a design for textile, wallpaper, floor tile, placemats, lamp shade. Let student make choice for the ideas are endless and he can let his imagination fly. Students can apply the design for purposes intended. Finished design may be black and white or colored.

TITLE: "Teleecology"--"Astroecology"

LEVEL: High School

OBJECTIVE:

To discover the "what and where" of astronomical bodies in seasons and some effects on specific plants and animals.

MATERIALS:

music: "Sunny Side of the Street"
star map
description for tracking the sun
a specific ecosystem

DESCRIPTION:

Each student is to study a marked area. Be sure they get distributed north-south-east-west. The students are to observe the area they have chosen and record kinds, leaf size, growth and also animal life. (4 weeks-- observation 2 times a week) Make a daily record of the path of the sun and times of sunset and sunrise. Students then compare their records to find effects of sun on each location.

RELATED ACTIVITIES:

tide study
farmers and the moon
animals (man included) and insects

TITLE: Preserving Reptiles

LEVEL: High School

OBJECTIVE:

Student will be able to quick-preserve a complete reptile.

MATERIALS:

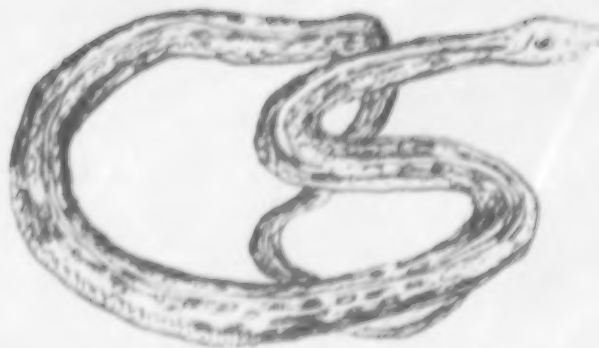
freezer
syringe
formaldehyde

DESCRIPTION:

This does not always work, but it's a new fad in preserving animals without putting them in a bottle. Instead of skinning the reptile and soaking skin in formaldehyde (100% effective, but hard) another method is to use multiple injections of formaldehyde throughout the whole animal then quickly freeze it for a couple of days. Take frozen animal and allow to dry out, then use lacquer to bring back color. Entire animal should now be completely preserved.

RELATED ACTIVITIES:

Collection of reptiles for study and comparison.



TITLE: Historical Development of an
Outdoor Laboratory

LEVEL: High School

OBJECTIVE:

The students will be able to research the history of an outdoor laboratory.

MATERIALS:

land abstract

DESCRIPTION:

Select or have two students volunteer to trace the history of the site.

1. Secure access to the land abstract for the school area campus. This will provide information dating back to the original acquisition of the property and trace its use through the preceding years.
2. After school acquisition of the land, consult with various faculty members - particularly science faculty members - to obtain names of significant people behind the development of the area. Also, get names of various public businessmen or organizations who have contributed resources or materials to the establishment of the site.
3. Align these events in a chronological order as an outline.
4. With the help of English department instructors and even social studies personnel, the student can then develop a brief paper describing the history of the development of the site.

A very important part of the program is the student factor in development of the site. List the events and individual students who were involved in the planning/development of the area. This "personalizes" the document and gives the students a sense of purpose and involvement in a project. Then they can "come back" and point with pride to the item that he or she left behind.

TITLE: The Snowmobile and You

LEVEL: High School

OBJECTIVE:

The students will itemize pro and con statements about snowmobiles.

MATERIALS:

clippings from newspapers
opinions from neighbors, friends, legislators, etc.

DESCRIPTION:

Arrange discussion groups of four or five to answer their choices of the questions below:

1. How many snowmobiles in Michigan?
2. What is the cost of different types of snowmobiles?
3. What noise controls can be purchased?
4. What damage is done to seedlings?
5. What does research say about their affect on wildlife?
6. What do farmers say about crop damage?
7. What do you know about the use of snowmobiles in human emergencies?

RELATED ACTIVITIES:

Write to Governor Milliken to ask what groups pressured him to sign the snowmobile bill into law.

TITLE: Key Construction Exercise

LEVEL: High School

OBJECTIVE:

To clarify the value of classification of objects according to a given key.

MATERIALS:

eight or ten objects with different characteristics (pictures may be used, if actual objects are not available)

DESCRIPTION:

Today we will construct a key to help us identify various objects. Doing this will help us understand how taxonomists make keys and how we can use them. As we construct the key we must keep the characteristics of the objects in mind. Does the object have the characteristics or not? Does this characteristic help us classify the objects into different groups or not? Here is our list of objects: a tennis ball, a butterfly, Mr. Leizerman, a steel ball bearing, a Boeing 747, Mrs. Marriott, a massasauga rattlesnake, a rubber eraser and a garter snake.

Let's look at these objects and study their characteristics.

The tennis ball _____
The butterfly _____
Mr. Leizerman _____
The steel ball bearing _____
The Boeing 747 _____
Mrs. Marriott _____
The rubber eraser _____
The garter snake _____

On a separate piece of paper, construct a key that will help us identify these objects.

At school we will use keys to help us _____

Find some reference that has a key in it.

TITLE: Rock Identification Wall

LEVEL: High School

OBJECTIVE:

Student will demonstrate multi-use concept.

MATERIALS:

igneous, sedimentary and metamorphic rocks
mortar

DESCRIPTION:

Almost every school yard has a severe soil erosion problem which can be corrected by a rock wall. If the rocks are arranged by their rough classification - igneous, sedimentary and metamorphic - the result will be an identification key in permanent form. Students can bring rocks back from vacation sites. This will add variety and interest to a rock and mortar construction.

RELATED ACTIVITIES:

Students can prepare a printed key of the rock wall to serve for a self-guided field trip.



TITLE: Conservation of Natural Resources

LEVEL: High School

OBJECTIVE:

To examine school and home to find ways to conserve our natural resources.

DESCRIPTION:

A. School

1. Establish a school recycling center for paper, glass, etc.
2. Plant trees, shrubs, flowers around school or in areas of potential erosion.
3. Collect water from a leaky faucet and measure the waste.
4. Chart water consumption required for toilet flushing over a given period of time.
5. Photograph examples of wasted resources in community.
6. Measure amount of waste paper for one school day.
7. Form School Conservation Club.

B. Home

1. Keep unneeded electrical units turned off.
2. Use stopper in sinks and wash bowl instead of allowing water to run while washing
3. Don't use toilet as waste basket.
4. Buy larger quantities when feasible to save packaging waste.
5. Have each child make up his own "Home Conservation Chart".
6. Conserve fossil fuels - investigate possible use of nuclear fuels.

TITLE: Parks in Genesee County

LEVEL: High School

OBJECTIVE:

The students will become familiar with the parks in our county.

MATERIALS:

maps
brochures describing Genesee County Parks and Recreation facilities

DESCRIPTION:

The students will give a short presentation describing the park. Following the presentation, the students can ask questions. Have them do follow-up reports on parks near their home. They should answer questions such as: "Who uses the park? Is your tax dollar well used here?"

RELATED ACTIVITIES:

Suggest that the students and their families take a trip to at least two areas.

TITLE: Observing a Pet Bird

LEVEL: High School

OBJECTIVE:

Students will observe a pet bird to note reflexes and mechanisms for perching.

MATERIALS:

pet bird

DESCRIPTION:

Bring in a canary, parakeet or other live bird. Have the students observe him for about ten minutes. Provoke observation with questions: "Does he have teeth?", How does he crack the seed?". Have several thought-provoking questions written down such as: "Look for the third eyelid. Draw attention to locking mechanisms of perching feet."

Give the students a list of possible nesting materials. Show them examples of real nests; let them loose in a field to try to construct their own nest (this gives them an idea of how intricate innate bird behavior really is).

Locate several nests yourself first (fall of the year is usually easier). Have the students compare size, depth, materials, height in the tree, location on tree, and type of tree. Perhaps they can add sketches for location on tree and try to guess the type of bird that built it.

Also, you might add a comparison between bird nests and a squirrel's nest.

TITLE: Food from Wild Plants

LEVEL: High School

OBJECTIVE:

The students will prepare and sample meals made from available wild plant resources.

MATERIALS:

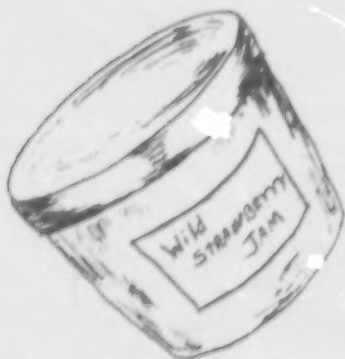
classroom reference materials for identification
wild plant recipes

DESCRIPTION:

By spending at least three days in the field, the students will learn to identify plants in the wild that can be used as food.

In the classroom, use the appropriate reference materials and allow the students to compile recipes on the preparation of some of the materials observed in the field. Have the students plan a wild meal from resources available.

Spend a day collecting food materials. In the classroom, the students can prepare, serve and sample their own cuisine.



TITLE: How Much Waste From Doing Your Own Thing

LEVEL: High School

OBJECTIVE:

The students will, by counting calories, food intake, water use and waste, learn how their daily habits quickly help deplete natural resources.

MATERIALS:

pen
paper

DESCRIPTION:

Student keeps track of all activities, foods, liquids, candies, etc., and times gone to the bathroom for washing, brushing and excretion. Then using general knowledge and books, figure out the caloric intake and liquid use (all) and find if overeating and great waste of water from washing, showering, growing food, washing dishes, etc., does deplete resources.

RELATED ACTIVITIES:

digestion

water conservation

TITLE: pH Lab

LEVEL: High School

OBJECTIVE:

To observe the influence that different pH environments have on Euglena (basic concept of pH).

MATERIALS:

microscope
3 test tubes
Euglena
hydrion papers
KOH solution
acetic acid

DESCRIPTION:

- a. Observe an Euglena under the microscope.
- b. Carefully draw one, enlarged.
- c. Describe how they move. Use diagrams and words to show how it is done.
- d. Fill 3 test tubes with 10 ml Euglena solution.
- e. Test and record the pH.
 1. Make one tube basic (pH 11) by adding one drop KOH solution. Label this tube BASE.
 2. Make one tube acidic (pH 4) by adding a few drops of acid solution. Label this tube ACID.
 3. Try to make one test tube exactly neutral (pH 7) by adding drops of acid and base. Stir carefully after each addition and check the pH of the solution. Label NEUTRAL.
- f. Leave overnight, then check the turbidity of each.

the more turbid = optimal environmental conditions
less turbid = poor environmental conditions

TITLE: Eat Off The Land Recipes

LEVEL: High School

OBJECTIVE:

To prepare a meal from materials found in the wild.

MATERIALS:

venison as entrée
side dish of mushrooms
wild asparagus spears
dandelion green salad
cattail flower-tops as the vegetable
hickory nut pie

DESCRIPTION:

Venison:

Roll chops or roast in seasoned flour. Brown in hot oil in a Dutch oven. Add 1 package dry onion soup mix and water. Cover and simmer for about 1 hour or until tender. Add water as needed. Serve hot drippings at the table.

Mushrooms:

Wash, clean, place in salt solution. Soak at least 2 hours. Rinse and dry. Sauté in heavy skillet over medium heat with 2 tablespoons of butter for each half pound of mushrooms. Brown and serve.

Asparagus:

Boil the spears in salted water until tender. Drain. Dot with butter.

Cattails:

Collect green flower stalks. Cook same as asparagus.

Dandelion Salad:

Collect fresh dandelion leaves in early spring and use as lettuce.

Hickory Nut Pie:

Make a pie shell for 9" pan. Beat 3 eggs slightly, then add 3/4 c. sugar, 1/2 t. salt, 1 c. dark corn syrup, 1/3 c. melted butter. Mix thoroughly. Stir in 1 1/2 c. hickory nuts and pour into pastry shell. Bake at 350° for 50 min. Cool before serving.

TITLE: Seed Study

LEVEL: High School

OBJECTIVE:

To acquaint students with the various mechanisms of seed dispersal and to show students the difference in germination requirements of herbaceous annuals, perennials, biennials, trees and shrubs.

MATERIALS:

dried stalks containing seeds of teasel, yarrow, milkweed, curly dock, burdock, Queen Anne's Lace, sycamore, basswood and any other plant available (these seed stalks should be collected in late winter after seeds have been exposed to a cold treatment)

DESCRIPTION:

During a winter field trip, collect dried stalks of the above mentioned plants. Note the habitat from which they are collected.

In the classroom have the students remove seeds from the plants noting the shape of the seed and how it relates to the way it is dispersed. Students can glue seeds on charts labeling the kind of seed and method of dispersal. (animal, wind, water)

Collect enough seeds on the trip yourself to have a supply to make a mixture to use for the seeds and then plant them. Students will begin to see the various needs of annuals, biennials, perennials for germination and growth.

RELATED ACTIVITIES:

Continue growing the plants for several weeks noting which grow best, growth habits, etc.

TITLE: An Epidemic

LEVEL: High School

OBJECTIVE:

The student will act as a carrier for non-pathogenic bacteria.

MATERIALS:

petri dishes
agar
tootsie roll
Karo syrup
broth culture: *sarccia marcisians*

DESCRIPTION:

Simulated Epidemic:

Petri dishes are prepared with sterile nutrient agar, one per student. For each student a candy dish is prepared by placing a tootsie roll with karo syrup poured over the candy. One of the candy dishes is inoculated with a broth culture of *sarccia marcisians*. Each student is assigned a number. On command, the student picks up his tootsie roll and karo syrup and squeezes it and shakes hands with someone else. He records the number of the persons who have shaken hands.

As many shakes are made as desired. (Four is about right.) Record the numbers and after compiling all the data, each student is to determine who started the epidemic. This demonstrates the viability and ease of transmission of a simple non-pathogenic bacteria.

TITLE: Transpiration

LEVEL: High School

OBJECTIVE:

The students will measure the rate of transpiration from the leaf of a plant.

MATERIALS:

saran wrap
dry cobalt chloride paper

paper clip
watch

DESCRIPTION:

Select a leaf on a growing plant. Place a square of cobalt paper on one or both surfaces of the leaf. Cover the leaf with saran wrap. Fasten it with a paper clip.

Measure the time it takes for the cobalt chloride paper to turn from blue to pink. Observe color changes over various lengths of time.

TITLE: Nature's Influence on Human Feelings

LEVEL: High School

OBJECTIVE:

To gain knowledge of nature's affect on human feelings.

MATERIALS:

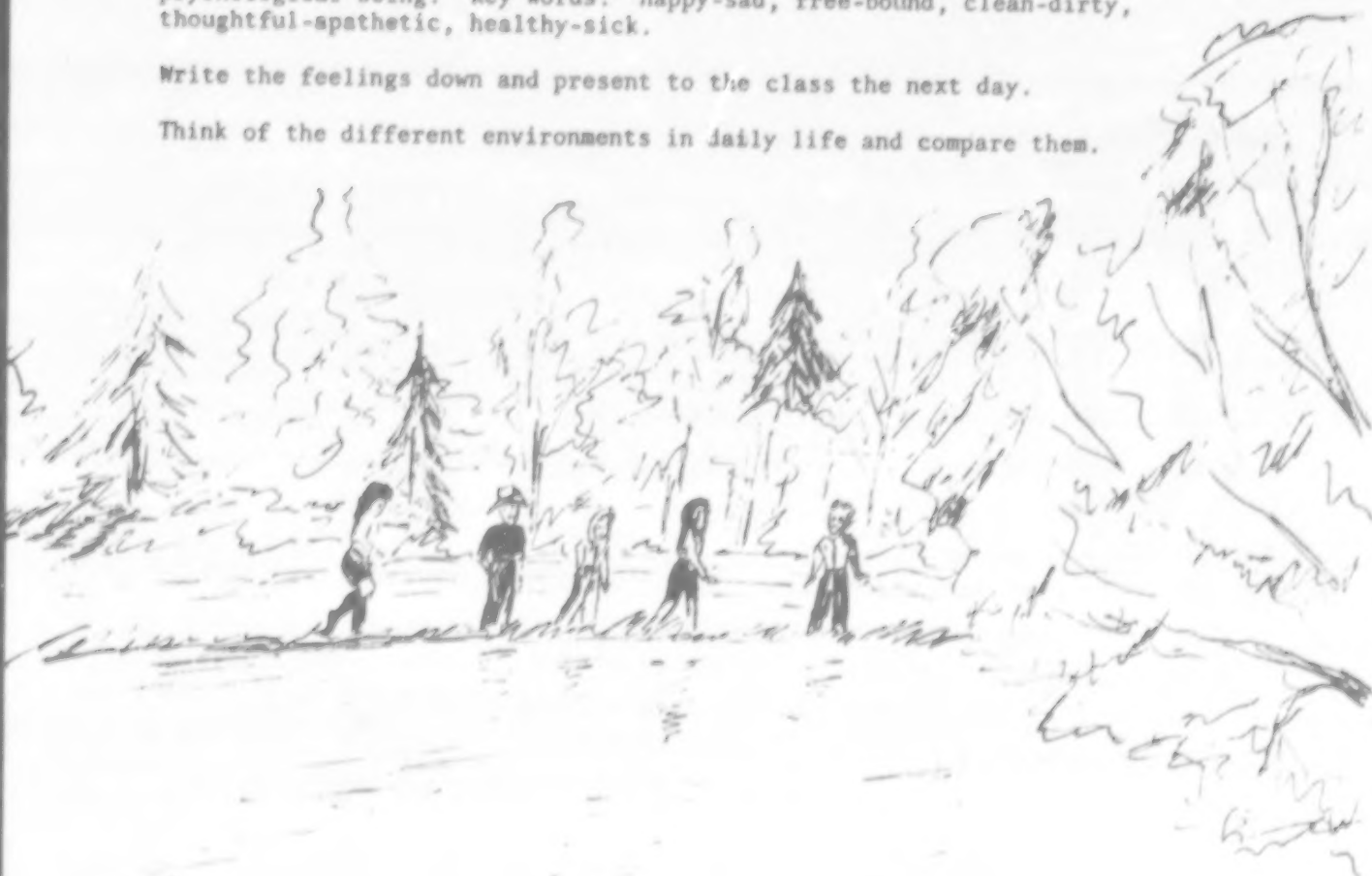
outdoor classroom
outdoor nature trails

DESCRIPTION:

Divide the class into groups of five. Each group is to walk silently for twenty minutes on the trail and by a pond, then meet at the outdoor classroom. They will then discuss their physical and psychological being. Key words: happy-sad, free-bound, clean-dirty, thoughtful-apathetic, healthy-sick.

Write the feelings down and present to the class the next day.

Think of the different environments in daily life and compare them.



TITLE: Biodegradability of Solid Waste

LEVEL: High School

OBJECTIVE:

To determine the length of time it takes different solid waste materials to decompose.

MATERIALS:

balance
rule
shovel

to check on different decomposition rates, use a variety of substances; e.g., tinfoil, aluminum foil, waxed milk carton, plastic bottle, newspaper--1 sheet and stack of 20, napkins, saran wrap, waxed paper cup, styrofoam, facial tissue, flashlight battery, regular cardboard, glass bottle, nylon hose, plastic bag.

DESCRIPTION:

Bury the above list of materials at a designated spot. Weigh and measure the materials before burial. After weighing and measuring, place all substances 8 inches under good topsoil. Mark the area well and leave materials buried for at least 30 days. It should be well-watered twice a week unless rainfall is sufficient. Bury a similar collection in a plastic garbage bag under the same conditions.

Dig up the materials after 30 days and make the appropriate measurements and observations.

1. What materials lost weight?
2. Did any gain weight? Why?
3. Did any material gain in thickness?
4. What materials remained unchanged?
5. Should all solid wastes be buried? Explain.
6. What will happen to unchanged materials in the future?
7. Is this method of waste disposal preferable to burning?

RELATED ACTIVITIES:

Discuss how the waste materials might be recycled.

TITLE: Micro-Succession in Pond Water

LEVEL: High School

OBJECTIVE:

To measure and describe succession in pond water.

MATERIALS:

2 gallons pond water taken 30 days earlier

2 gallons of pond water (same part of pond) taken that day

DESCRIPTION:

During a field trip, collect 2 gallons of pond water. Try to get some mud, vegetation, floating wood and rocks. Cover and set aside for about one month. You can use this first part as a study of the pond community and to reproduce a miniature pond community.

About a month later, take a new sample from the same place. Then compare both obvious and microscopic differences. Obvious changes may include tubiflex worms and algae growth (possibly growth or death of larger plant and specimens). Examine daphnia and other microscopic specimens and compare number counts. You may find insect larvae or insects in the mud, so you may want to strain the mud. Also compare quantitative analysis of algae types (% of type A to % of type B, etc.)

TITLE: Rivers: Importance to a City

LEVEL: High School

OBJECTIVE:

To understand the need for clean water in our cities.

MATERIALS:

bus
Genesee Recreation Area (1½ hours)
Water Plant (1 hour)
Sewage Treatment Plant (1 hour)

DESCRIPTION:

After taking the tours, discuss what was learned. Have the students list ten facts about the trip.

RELATED ACTIVITIES:

river basin studies
industrial water pollutants
nature trails

TITLE: Environmental Continuums

LEVEL: High School

OBJECTIVE:

The students will state (non-verbally) their personal values on environmental issues.

DESCRIPTION:

The students take a space on a continuous line at one end of a continuum labeled "Amy Always", the opposite end labeled "Nellie Never", the center of the continuum labeled "Sid Sometimes". The question, "What is your personal responsibility for _____?" precedes each item: pollution of quiet, litter, invasion of state camping grounds, landfill, vandalism, etc.

RELATED ACTIVITIES:

The students can develop relevant lists of environmental issues.

TITLE: Air Pollution: Awareness Walk

LEVEL: High School

OBJECTIVE:

To list sources of air pollution. Be able to list several sources and possible solutions.

MATERIALS:

area where serious air pollution exists

DESCRIPTION:

Air pollution. To see the areas where the causes of air pollution can be found. Trips can be taken to just sight see and point out the air pollution areas. Makes the students aware that they can eliminate some pollution by changing some of their everyday habits like not burning leaves or trash, by not smoking, or by walking instead of driving. Point out some solutions to air pollution problems.

RELATED ACTIVITIES:

1. water pollution walks
2. soil pollution walk or trip; e.g., salt damage along roadways
3. sight pollution; e.g., litter

TITLE: Study of Fish Anatomy—a different way LEVEL: High School

OBJECTIVE:

The students will construct a fish exterior using descriptions, location and general shape of fish.

MATERIALS:

paper
glue
newspaper (for stuffing)
scissors
stapler

DESCRIPTION:

Student constructs any type of weird fish he would like to design but he must construct it using the true anatomy of fish (gills, operculum, anal fins, etc).

Activity - While doing fish dissection, to relate and make study more interesting, student is given colored paper and glue, etc., and constructs a fish (similar to a chinese dragon fish) using supplies and stuffing with newspaper. This can also be used while studying fisheries to give class indoor activity. This helps build creative thought and stimulates further follow up by students.

OBJECTIVE:

To determine the physical properties of water.

MATERIALS:

beaker
thermometer
Bunsen burner
stirring rod
2 ice cubes

DESCRIPTION:

- Fill beaker with 50 ml tap H_2O .
- Add 2 ice cubes and stir well (important to stir well).
- Place over Bunsen burner.
- Take temperature readings every minute. Be sure to keep stirring.

DATA

time	t°
0	
1	
2	
3	
↓	

- Take 5 more readings after the liquid starts to boil.
- Graph data: temperature on vertical axes, time on horizontal graph.



Graph should look like the above. If graph is jumpy it's because student didn't stir well.

Each plateau represents a change of state: the first, from solid to liquid; the second: from liquid to gas.

Ask questions in "graph analysis" leading student to the concept that:

heat = energy

energy increase = temperature increase

no temperature increase (flat plateau on graph) indicates energy has gone into changing the state of the water.

OBJECTIVE:

The students will learn about the feeding habits of the owl by analyzing owl pellets.

DESCRIPTION:

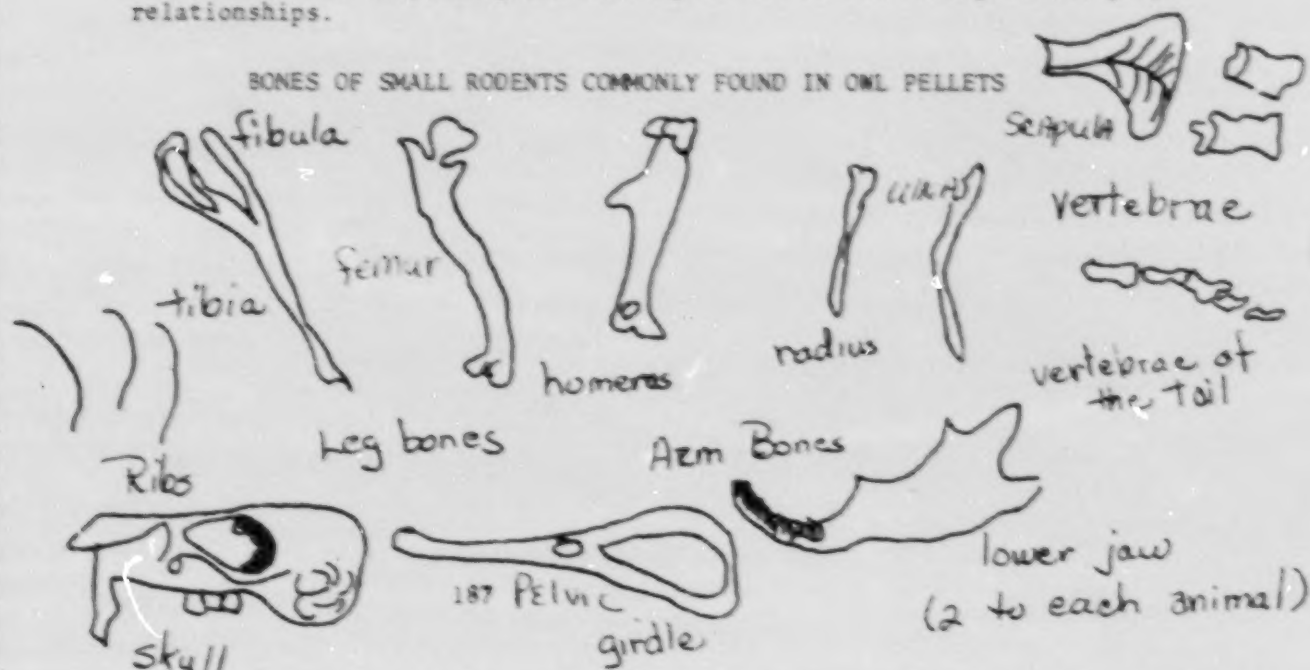
A stimulating and impressive exercise to illustrate the feeding habits of owls, is to collect and examine the contents of owl pellets. An owl, when feeding, will frequently swallow an entire animal. The strong digestive fluids in the stomach will dissolve everything except the indigestible fur and bones. The bones (completely cleaned of all flesh, tendons and ligaments) and fur are meshed together into a pellet about the size and shape of a man's thumb, passed into the bird's mouth and dropped on to the ground.

Owl pellets will vary as to size, depending on the species of the owl. Pellets regurgitated from long-eared owls are commonly found under conifers and are normally 1 1/2 to 2 inches in length and 3/4 of an inch in diameter. Great horned owl pellets are frequently 4-5 inches long.

It is reasonably easy to find owl pellets at the base of pine or spruce trees in most conifer areas. During the winter months many of our local owls, such as long-eared owls, will roost in particular trees night after night. Under these roosting trees large numbers of pellets may accumulate during the winter months.

A dozen or more of these pellets can be collected and brought into the classroom for examination. This will provide lesson material of unusual interest regarding the feeding habits of owls and predator-prey relationships.

BONES OF SMALL RODENTS COMMONLY FOUND IN OWL PELLETS



TITLE: Habitat Improvement

LEVEL: High School

OBJECTIVE:

The students will identify and/or demonstrate the effectiveness of habitat improvement practices.

MATERIALS:

booklet Habitat Improvement for Wildlife, by the Audubon Society

DESCRIPTION:

1. Hand out a reprint of an area that has been managed well (picture map variety). Have the students list all the improvements (should be 50-60). The reprint can be found in a booklet entitled Habitat Improvement for Wildlife, by Audubon Society.
2. Have the students draw a picture map of their own backyard as is, and then as it is improved for wildlife. The students must make their own legend.

RELATED ACTIVITIES:

Consult available resources: Soil Conservation District

Visit farms and improved wildland that shows effective improvement practices.

Visit land that is barren of wildlife. As a class, plan an improvement program for the area.

See the activity titled "Water Pollution in Lakes and Streams". Many habitat projects also aid in reducing water pollution.

TITLE: Construction of Classification Key
-OR-
Key Construction Exercise

LEVEL: High School

OBJECTIVE:

To clarify the value of classification of plants and animals according to a taxonomy key.

MATERIALS:

paper
pencil

DESCRIPTION:

The ways of separate living things should first be discussed indicating that this is how we actually "name" the different plants and animals in our environment. It should be emphasized that differences as well as similarities exist between living things.

Activity: the child will divide his classmates into halves. For example, boys and girls. Then proceed to divide each half--brown eyes vs. not brown eyes and red hair vs. those who do not have red hair, etc. Surprisingly fast, each child will be separated from all the other classmates in the key.

RELATED ACTIVITIES:

Mathematics: using this class as a representative sample of a population, determine the probability of certain characteristics occurring

Social Studies: using such characteristics as hair, skin, eyes and name, determine the possible origin (country) of the students

Writing: write about either or both of the above activities

TITLE: Man and Nature: Harmonious Interaction

LEVEL: High School

OBJECTIVE:

To observe and describe ways that man-made amenities can blend with and complement natural surroundings.

MATERIALS:

parks
man-made structures that aid nature (ponds, erosion control, improved trails, etc.)

DESCRIPTION:

Take a field trip to a park area that shows evidence of man-made accommodations blending in well with the landscape; e.g., wooden signs lettered in colors that blend with surroundings, rustic benches, concealed garbage containers, wood chips on the trail (to keep visitors on the trail, minimize dust, eliminate mud and preserve natural looks), wood fences (as opposed to metal), water fountains, map areas, picnic areas, etc.

The students should have a fill-in form to direct their attention to appropriate places.

A good area to visit is the Mott Park Stepping Stone Falls.

RELATED ACTIVITIES:

Take trips to farms to see the harmony between man and nature.

TITLE: Automobile Pollution

LEVEL: High School

OBJECTIVE:

To determine the passenger/car ratio at different locations and different time periods.

MATERIALS:

pencil and paper for recording information

DESCRIPTION:

Pick out different locations for observing and recording the number of people in each car that goes by. . Select a busy corner in the city, a road going into a factory, school driveway, residential street corner. Observe the cars for 1/2 hour each day, Monday through Friday, and record data on a chart as follows:

	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6+</u>	passengers
Date _____							
Time _____							
Place _____							

1. At what time is the number of passengers per car greatest? At what time is it the least?
2. How do the different locations compare?

Record any special events in the community that might affect the results. What prediction would you make concerning the future number of passengers per car? What excuses are used by individuals for not wanting to ride with others? In your opinion, has the number of passengers per car increased or decreased in the past few years?

OBJECTIVE:

The students will identify the various small meadow mammals and prepare a collection of skins and/or skulls for study. They will also be able to describe the role of these animals in their community.

MATERIALS:

traps
deep freeze
solution to preserve skins (see activity "Tanning Animal Hides")

DESCRIPTION:

In an open field, locate meadow vole (*Microtus*) runways and place traps baited with a small ball of oatmeal and peanut butter near the runway. Have each student run several trap lines. (Runways are easily located by the tunnels made under thick thatches of grass.) Traps should be checked each day in the morning before exposure to sunlight for any length of time and at night. Most students setting six traps each will have luck trapping a meadow vole within two days. While students are in the field, they are to make notes on types of vegetation, proximity of runways, evidence of diet if fecal pellets are located.

In the classroom, the animals should be quick-frozen by placing them in the deep freeze until ready to use. Study skins can be prepared by skinning the animal and stretching the skin over a piece of cardboard cut to shape of body. Students who are especially interested can use this same technique with other small mammals for preparing a study skin collection.

A discussion of meadow communities will accompany the activity in the classroom stressing the role of predator-prey relationships as this mammal is one of the most common prey animals.

RELATED ACTIVITIES:

Writing: description of life in a meadow

Mathematics: compute the offspring from one pair of these animals assuming 100% survival (no predator control, etc.) over a period of five years

TITLE: Diary of a Tree or Shrub

LEVEL: High School

OBJECTIVE:

The student will develop the power of observation, develop the ability to write clearly and accurately and increase his knowledge of trees and shrubs.

DESCRIPTION:

Each student selects a deciduous tree or shrub which is on the school grounds. This activity spans the school year. The learner's task: observe and record on a regular basis all the physical characteristics and changes that take place concerning that particular tree or shrub during the school year, note and record any observable influence the plant has on other plants or animals.

The student will:

Keep an accurate record of the selected tree or shrub.

Make a detailed drawing of the plant.

Classify the plant.

Measure the plant; i.e., height, girth.

Observe and record seasonal changes in the plant.

RELATED ACTIVITIES:

Writing: an essay on the importance of trees and shrubs

Mathematics: estimating the height of a tree

TITLE: Leaves and their Prints

LEVEL: High School

OBJECTIVE:

Students will be able to use a key for leaf identification.
Students will also learn the techniques of making leaf prints.

MATERIALS:

leaves
leaf keys
newspapers
ink or stain

brushes
art paper

DESCRIPTION:

1. Collect a variety of tree leaves on a field trip.
2. Identify leaves with the help of a key.
3. Spread newspapers and lay out a leaf.
4. Brush ink or stain evenly over leaf.
5. Place a piece of art paper over the prepared leaf and press down.
6. Remove art paper and set it aside to dry.
7. Designs may be made by grouping several leaves together.



TITLE: Art With Mushrooms

LEVEL: High School

OBJECTIVE:

Students will be able to make spore prints.

MATERIALS:

mushroom caps
tag board
Elmer's glue

-or-

mushroom caps
wax paper
flat iron

DESCRIPTION:

Coat the tag board with Elmer's glue. Place mushroom cap (gill side down) on the prepared tag board. Cover with a glass dish and let it all stand overnight.

-or-

Lay mushroom caps (gill side down) on waxed paper. Cover with a glass dish and let it stand overnight. Turn flat iron on "low". Turn iron flat side up and place underside of spore print on iron. The spores will settle into the melting wax. Prints can be mounted on colored paper for contrast.

TITLE: Tanning Animal Hides

LEVEL: High School

OBJECTIVE:

The students will participate in tanning an animal hide.

MATERIALS:

hides donated by hunters in the area

salt 5#

tanning solution (1 gallon boiling water, 1 quart salt, cool water,
1 ounce H_2SO_4 (concentrate))

neat's foot oil

borax

DESCRIPTION:

1. Make enough solution to cover hide. Store in plastic or earthenware.
2. Clean all fat and flesh off the hide. Use knives in a cake-slicing motion until the white membrane is visible.
3. Rub in salt 5# for deer hide, less for smaller animals.
4. Let hide sit for one week.
5. Place hide in tanning solution stirring twice a day for two weeks. No blue spots will be visible when hide is ready.
6. Rinse hide and soak in borax and water for two hours.
7. Spin or drip dry, scrape and rub edges together.
8. Soften by rubbing with a blunt instrument and neat's foot oil.
9. Stretch hide, dry and brush hair.

RELATED ACTIVITIES:

Social Studies: reading on use of hides and leather

Vocational: jobs are available in this field

TITLE: Role-Play of a Community Problem

LEVEL: High School

OBJECTIVE:

The students will recognize the many problems involved in community planning.

MATERIALS:

3 x 5 cards

DESCRIPTION:

Prepare 3 x 5 cards with professions and jobs such as mayor, doctor, gas station owner, housewife, etc. Make two other sets of cards containing health problems and attitudes that the members of the community are to assume. Have students randomly select cards in each group. Tell the students that they are all attending a city council meeting to determine the course of action on any type of situation you wish to create such as allowing a large firm to build a factory in the area, creating sewage disposal plants involving an area of land presently used by sportsmen, etc. The possibilities are limitless!

RELATED ACTIVITIES:

Social Studies: community planning, pressure groups, decision-making

Art: map drawing

Language: written reports from individual or committees

Field Trip: council meeting



TITLE: Decision-Making

LEVEL: High School

OBJECTIVE:

The students will conclude that "where one lives influences what one values."

MATERIALS:

observers who will feed back responses, verbal and non-verbal

DESCRIPTION:

1. Announce to the class that a mayor of a large city, about the size of Milwaukee, is going to meet with representatives of two different groups concerning a controversial issue. The issue is whether or not commuters should be allowed to use city facilities such as public library without a nominal fee. The fee can be paid in one of two ways: each person who enters the library pays 50 cents or the place of residence (suburban city hall) will be charged 50 cents per book checked out with funds for this coming from tax money collected in the suburb.
2. Choose one person to be the mayor. Have the remainder of the class form two groups, one representing the commuters and the other representing the city dwellers. Have one group sit on one side of the room and the other group sit on the opposite side with the mayor in the middle.
3. Give each side 10 minutes to talk to the mayor with the other side remaining quiet. Then let the sides debate with each other in front of the mayor for 10 minutes.
4. Have the sides change roles for a brief time if they wish.
5. Inform the mayor before class that he should not make a final decision at this time but ask sides to get more information.
6. Discuss issues and resultant problems.
7. Have a representative of the city's office of the mayor and a similar representative from a suburb visit the class and/or have a small group of student volunteers tape-record interviews at respective community offices and replay recording for entire class.

TITLE: Micro-Climates

LEVEL: High School

OBJECTIVE:

To make students aware of how climatic factors vary over a small geographical area and to provide practice using weather instruments, to record weather data and to observe different species of plant and animal life existing together.

MATERIALS:

thermometers
sling psychrometers
shovels

trowels
containers (large juice cans, etc.)
writing materials

DESCRIPTION:

This activity may take place in any of the following areas: sunny open area of the school; shaded side of the school; north and south side of a fence or wall; a ditch or hole; dark and light surfaces such as black-top and cement; highest and lowest point on the property; if snow is present, the surface, ground level and bottom of depression.

Procedure: Divide the class into as many small groups as you have sites. Have the students measure and record air and soil temperature at the surface and at specified distances above and below surface; i.e., 8 cm below, 5 cm and 180 cm above surface. Determine the relative humidity. Observe the texture and condition of the soil (have groups compare information). Draw attention to kinds of plants. Include some type of keying activity if you wish. Relate climate, soil, plant factors. Samples of plants and soils may be removed for use in the classrooms.

RELATED ACTIVITIES:

In the classroom, make charts that compare information from the various sites sampled. Some students might wish to try duplicating the outdoor environment in the classroom.

TITLE: Temperature Conversion

LEVEL: High School

OBJECTIVE:

At the completion of this exercise, the student should be able to convert a centigrade temperature reading to fahrenheit and vice-versa.

MATERIALS:

pencil
paper

DESCRIPTION:

To convert temperatures from one scale to the other remember the following:

A fahrenheit degree is only $\frac{5}{9}$ of a celsius degree and $32^{\circ}\text{F} = 0^{\circ}\text{C}$ (the freezing point of water). If you know the temperature in $^{\circ}\text{F}$, and wish to change to $^{\circ}\text{C}$, you first subtract 32 from the fahrenheit temperature and take $\frac{5}{9}$ of the remainder. To convert from celsius to $^{\circ}\text{F}$, you reverse the process: multiply the celsius temperature by $\frac{9}{5}$ and add 32.

RELATED ACTIVITIES:

Charts (picture of a $^{\circ}\text{F}$ and $^{\circ}\text{C}$ thermometer side by side) can also be used. The boiling point and freezing point of water, normal body temperature and average room temperature can be easily compared this way. Students should be familiar with both methods.

$$\underline{{}^{\circ}\text{F} - 50 = {}^{\circ}\text{C} - 10}$$

$$\begin{array}{rcl} -1- & 50 & -2- 18 \times \frac{5}{9} = 10 \\ & -32 & \\ \hline & 18 & \end{array}$$

$$\underline{{}^{\circ}\text{C} - 10 = {}^{\circ}\text{F} - 50}$$

$$\begin{array}{rcl} -1- & 10 \times \frac{9}{5} = 18 & -2- 18 + 32 = 50 \end{array}$$

TITLE: Scavenger Hunt: Nature

LEVEL: High School

OBJECTIVE:

Identify natural materials and describe their usefulness.

MATERIALS:

one grocery bag per group
one tally sheet per group
an area to conduct the hunt

DESCRIPTION:

Make a list of materials found in nature (bark, dogwood, something perfectly round, something that reminds you of art, etc. and number them. (You can use previously learned material by rephrasing materials: instead of asking for acorns, ask for deer food, providing you have studied deer earlier.) Provide a sheet divided into rectangles and tape (6 rolls to a class is sufficient). If you ask for materials in an open-ended fashion, you'll get some interesting results.

RELATED ACTIVITIES:

See "Scavenger Hunt: Litter".

TITLE: Scavenger Hunt: Litter

LEVEL: High School

OBJECTIVE:

To locate and explain sources of litter and make suggestions for correction of the problem.

MATERIALS:

one tally sheet for each group
one plastic garbage bag for each group
an area in which to conduct the hunt

DESCRIPTION:

Divide the students into groups, giving each a large plastic bag for collection. Give them a specified length of time to collect litter (30-45 min.). At the end of this time all groups return to the starting point. Now give each group a worksheet on which letters of the alphabet are listed. Someone from the group is selected to record kinds of litter found by the appropriate letter.

The object is to find litter beginning with each letter of the alphabet, or as many letters as possible - not which group finds the most, as is expected. Don't tell them this until after the time limit has expired and groups are ready to check lists.

RELATED ACTIVITIES:

See "Scavenger Hunt: Nature".

TITLE: Taxidermy of a Snake

LEVEL: High School

OBJECTIVE:

The students will be able to identify common varieties of snakes, identify the internal and external parts of a snake and take home a preserved specimen.

MATERIALS:

one snake per student (if supply is limited, one snake per two or three students)
alum 4 oz.
salt 8 oz.
 H_2SO_4 1/2 oz. (optional)
Borax (20 mule team) 1 box
sand

DESCRIPTION:

1. Make incision from four inches behind the head to near the tail.
2. Remove skin from the body, inverting skin over head. Keeping the skin attached, clean all meat from the head.
3. Soak the skin in solution of 1 gallon water, 4 oz. alum, 8 oz. salt and 1/2 oz. H_2SO_4 for two days. (H_2SO_4 optional)
4. Rinse, rub in borax.
5. Sew up incision and fill cavity with sand.
6. Place the snake in the desired position and let dry until hard.
7. Apply a coating of clear lacquer if desired.

RELATED ACTIVITIES:

Writing: describe the snake in terms of habitat, feeding habits, reproduction, value to nature, etc.

Mathematics: estimate amount of sand required to fill body cavity



TITLE: Water Pollution in Lakes & Streams

LEVEL: High School

OBJECTIVE:

To isolate pollutants found in water samples using testing kits for that purpose. To suggest possible ways of correcting the problems.

MATERIALS:

water testing kit
lake or stream water samples

DESCRIPTION:

To study water pollution, obtain water sources from various areas. Included in these could be areas that relate to the students, such as streams or rivers. Samples from rivers should come from various areas along a river to determine the pollution level at strategic spots of this river. Example could be the area of the river serving as the intake for water supply or the exhaust from the sewage plant. Other areas may include a lake used primarily for fishing or swimming, considering the size and depth of the lake. The samples are then to be tested with the Hach Water Kit to determine the pollutants found in the water. This way the cause of pollution could be determined and possibly a remedy to cure the problem.

RELATED ACTIVITIES:

See activity titled: "Habitat Improvement" for a connection between water pollution and habitat improvement.

TITLE: Case Study on the Topic "Hunting"

LEVEL: High School

OBJECTIVE:

The students will discriminate between legal and illegal hunting practices.

MATERIALS:

State of Michigan Hunting Regulations

DESCRIPTION:

The students will examine a set of situations which are actual hunting practices gleaned from newspapers and experiences. The principles involved in bag limits, number in possession, point system, off-season, bow and arrow, sex, rutting season, sportsmen and clubs, preserves, reserves, etc., will be discussed in company with hunting regulations established by the state.

RELATED ACTIVITIES:

Secure copies of current waterfowl hunting rules. Give the student a list of situations and ask them to determine whether they are legal or illegal. You'll have to explain the point system first, also set up your situations to include in-seasons vs. off-seasons, bag limits, number in possession and miscellaneous rules (e.g., "you may hunt with a bow and arrow, you may not use bait," etc.).

TITLE: Pollution: Terrestrial

LEVEL: High School

OBJECTIVE:

The students will identify terrestrial pollution and suggest ways to correct the problems.

DESCRIPTION:

Take a field trip to an area where all-terrain vehicles are used for recreation.

- a. Point out the consequences of trails made straight up a hill by a motor bike or other vehicle.
- b. Explain how vehicles can be used without causing damage.
- c. Show the results of grazing in a wooded area.
- d. Show the after effect of road salt on trees near the road.
- e. Show the destruction of habitat due to housing developments or drainage of swampy areas.



TITLE: Taxonomy: Let's Pretend

LEVEL: High School

OBJECTIVE:

The students will classify and identify objects.

MATERIALS:

copies of rules for groupings for each member of the class

DESCRIPTION:

One of the branches of science that we deal with in the classroom is taxonomy. The word taxonomy is made up of two Greek words--taxis which means to arrange and nomos which means law. We have put these two Greek words together to make the word "taxonomy" which means the science of classification.

When we classify things, we arrange them into groups. If we arrange them into groups scientifically, we follow certain laws or rules. A taxonomist is a person who classifies things into groups according to certain laws; these laws are based upon the characteristics of the things he is classifying.

Let's pretend that we are taxonomists. Let's classify these four things into their proper groups by following certain laws. Suppose we have     to classify. Suppose that these objects are either gleeps, gloops, glicks or globs. Suppose that in order to classify these things scientifically we follow these laws:

Gloops are round.
Gleeps are round.
Glicks and globs are not round.
Gloops have arrows.
Gleeps do not have arrows.
Globs have arrows.
Glicks do not have arrows.

Using these laws we have discovered that  is a _____;
that  is a _____; that  is a _____; and that
 is a _____.

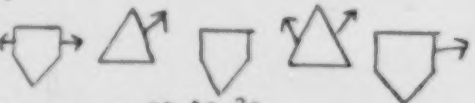
Taxonomy: Let's Pretend (Continued)

When a taxonomist classifies things, he uses a key. A key to the classification of gleeps, gloops, glicks and glebs might look something like this:

- 1a Round objects go to. 2a
- b Objects that are not round 3a
- 2a Objects that have arrows Gloops
- b Objects that do not have arrows are. Gleeps
- 3a Objects that have arrows are Globs
- b Objects that do not have arrows are. Glicks

At each step in the key we looked at the characteristic of the thing we are interested in. Either it had this characterisitic or it didn't. In either case, the key told us where to go next or what the thing was. It helps _____ the object.

Let's use the key to identify the following:



- 1a Three sided. go to 2a
- b More than three sides. go to 3a
- 2a One arrow. Tibe
- b More than one arrow. Tope
- 3a Has arrows go to 4a
- b No arrows. Sak
- 4a One arrow. Sike
- b More than one arrow. Sime

Using this key, we have classified and identified these objects:

 is a _____  is a _____

 is a _____  is a _____

 is a _____

TITLE: Biochemical Oxygen Demand

LEVEL: High School

OBJECTIVE:

To discover micro-organisms in water.

MATERIALS:

- 1 plastic spoon
- 2 baby food jars
- 1 level teaspoon powdered milk
- 1 level teaspoon dry yeast
- 1 dropper bottle methylene blue solution
- 2 5ml air piston
- 3 test tube--10 ml
- 1 test tube rack
- 1 wax marking pencil
- 1 watch or clock

DESCRIPTION:

- A. Prepare a sample of milk by slowly stirring 1 level teaspoon of powdered milk into 20 ml of tap water in a baby food jar. Mark the jar with an "M".
- B. Prepare a sample of yeast by slowly stirring 1 level teaspoon of dry yeast into 20 ml of water and mixing thoroughly. After a minute or so, stir the mixture again. Be sure the yeast is well mixed and has not settled to the bottom. Label the jar "Y".
- C. Use the marking pencil to number three clean test tubes 1 through 3. These tubes should hold at least 10 ml of liquid.
- D. Using one 5 ml air piston for water and another 5 ml air piston for milk. Add to the three test tubes the exact amounts called for in "A". Stir each mixture thoroughly.
 - 1. What is the total volume of liquid in each tube?
 - 2. Which tube has the highest concentration of milk?
 - 3. Which tube has the lowest concentration of milk?
 - 4. Methylene blue indicates the presence of oxygen. Why would methylene blue indicate that oxygen is present at the surface of the liquid?

Biochemical Oxygen Demand (Continued)

- E. Add 20 drops of methylene blue solution to each tube.
 - 1. Does each of the three milk-methylene blue mixtures contain dissolved oxygen?
- F. Mix milk (sewage) and yeast (decay) micro-organisms to see what happens to B.O.D.
 - 1. What do you predict will happen to the blue color in the three tubes if the yeast uses up all the oxygen?
 - 2. In which tube would you expect a change to occur first?
- G. Mix these with the micro-organisms. Add the yeast to the sewage. (20 minutes are needed to complete observations)
- I. Add 2 ml of yeast solution to the first test tube, mixing thoroughly. Record in table 3-2 the exact time the mixing starts. Once the timing has begun, don't disturb the tube. Jostling it will introduce air into the liquid. Repeat the procedure for the other two tubes. Be sure to record the starting time. It will take several minutes for changes to occur.

The more food supplied to the micro-organisms, the faster the dissolved oxygen supply is used up. How do these observations apply to the decay micro-organisms in surface water?

- 1. What influence would dumping large quantities of sewage into a river, stream or lake be likely to have on the amount of oxygen dissolved in the water?
- 2. What do you predict happens to the population of decay micro-organisms when sewage is dumped into their environment?
- 3. Predict the result an increase in decay micro-organisms would have upon their biochemical oxygen demand?
- 4. What result would increasing the B.O.D. of one kind of organism population have on the population of other oxygen, using organisms in the same environment?
- 5. How should the increase in an oxygen-using population of micro-organisms affect the amount of oxygen present in an environment?

TITLE: Tree Spying in the Field and Woods

LEVEL: High School

OBJECTIVE:

The students will be able to identify trees in the field.

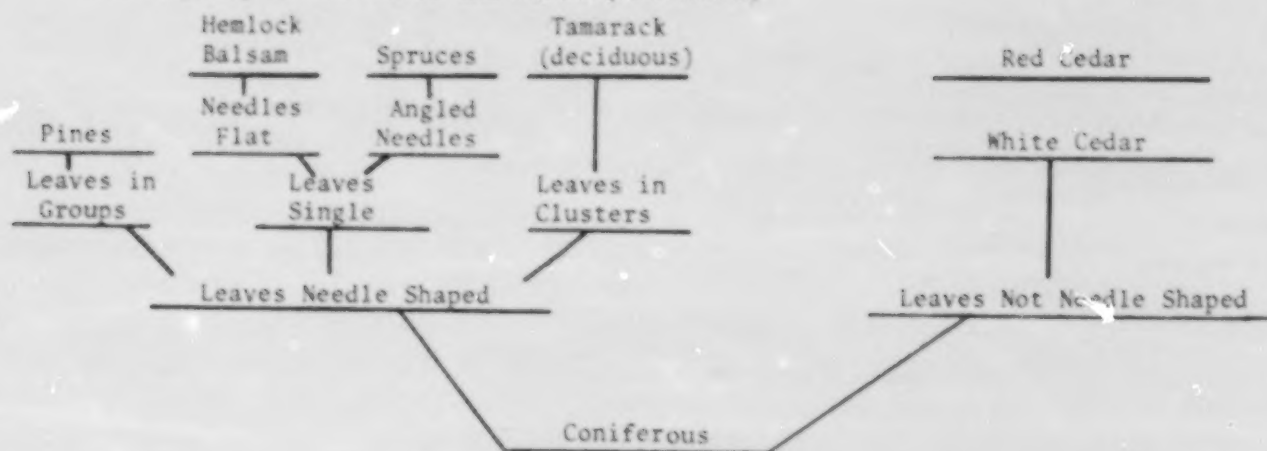
MATERIALS:

handout sheets--Tree Road Map

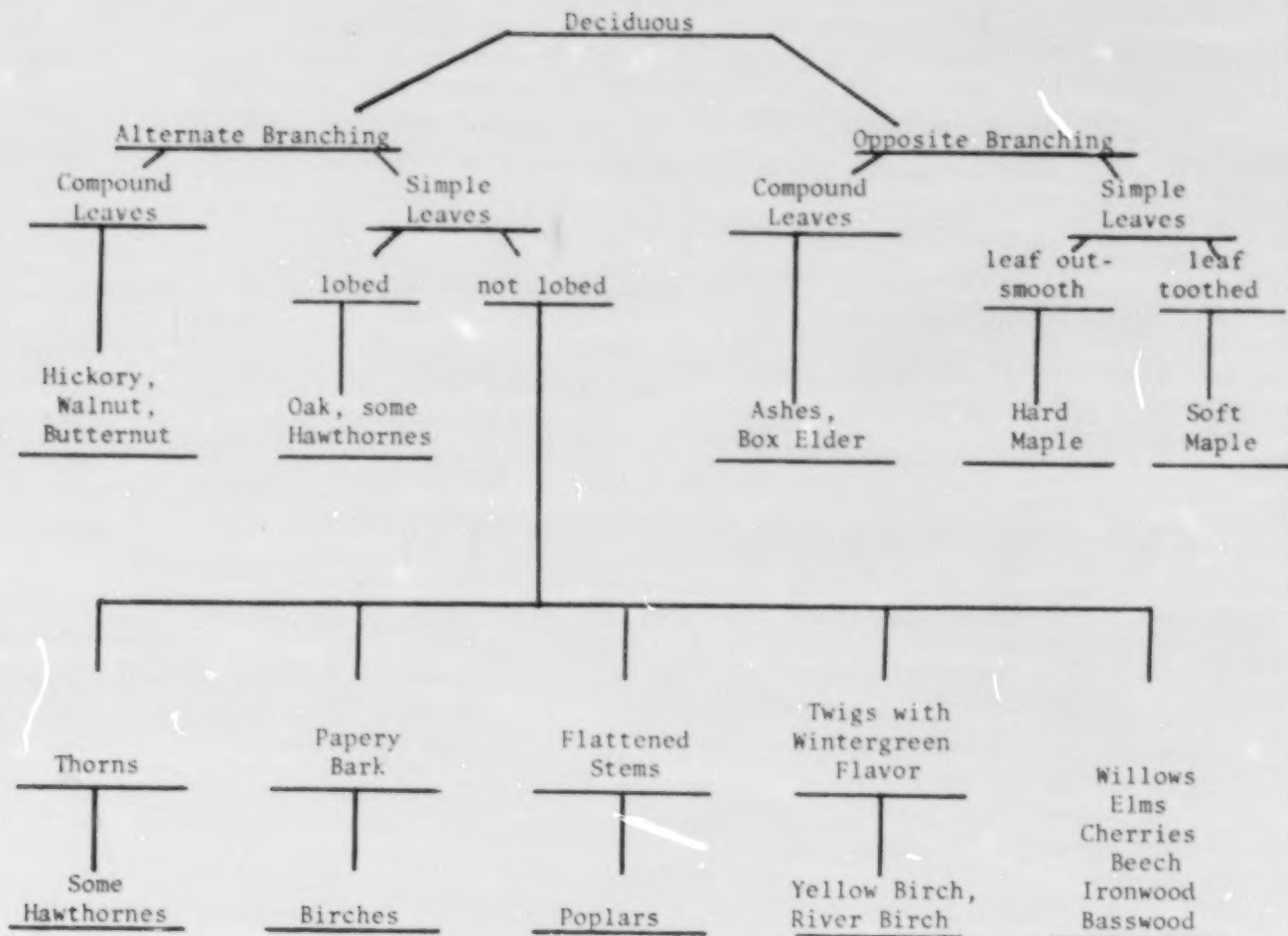
DESCRIPTION:

1. Take a walk.
2. Use the map on the following page.
3. Identify the trees in the area.

Tree Spying in the Field and Woods (Continued)



What kind is your tree?-----> Tree Road Map <-----Read the signs, follow the arrows.



TITLE: Study of a Maple Tree in Mid-Winter

LEVEL: High School

OBJECTIVE:

The student should be able to describe in detail, most aspects of a maple tree (shape, bark, trunk, fruits, buds, habitat, etc.) within one week.

MATERIALS:

paper
pencil
compass
soil auger

measuring tape
hand lens
three 1/2 ft. stakes
handout of procedure and description

DESCRIPTION:

Choose a tree that grows in the open for this study.

The students will answer the following questions on separate sheets of paper.

I. Where the trees grow.

1. Describe the slope of the land where the tree grows.
2. Using a soil auger, take a soil profile and describe it.
3. Measure the distance to the three nearest trees. Would you say these trees are competing with your tree? Why? Are any of them maple trees?
4. Do you find any clues in the tree as to whether it has ever had to compete with other trees? Explain.
5. What plants do you find growing under your tree? Are they any different from the plants growing in the open? Explain.

II. Shape of the Tree.

1. Sketch the tree and label the bole, branches, spray and head.
2. Can you tell from the shape of the tree which way the wind blows most often? Explain.
3. How high on the trunk do the first branches come out? At what angle?
4. What do the branches do for the tree?
5. Examine the spray. Are all the small twigs arranged opposite or alternate? What does the spray do for the tree?
6. Are there any large scars on the tree? What might have caused them?

Study of a Maple Tree in Mid-Winter (Continued)

III. Bark

1. Is the bark smooth or rough? Are the ridges smooth, fine or coarse? Vertical or horizontal?
2. Compare the bark on the trunk with that on the branches and twigs.
3. What does the bark do for the tree?

IV. Trunk

1. Measure the distance around the trunk (3 ft. above the ground). Record.
2. From the above measurement, calculate the diameter of the trunk. (circumference = π x diameter)

V. Fruits

1. Find a fruit from this tree on the ground. Sketch it, labeling the parts.
2. Hold the fruit above your head and drop it, counting "and-a-one", "and-a-two", etc. How many counts does it take to reach the ground?
3. Describe how the seed fell. Did it drop straight down, sail or flutter?
4. How might the way in which the seed falls affect the spread of maple trees?

VI. Buds

1. Describe the buds after examining them with a hand lens. What color are they? Are they shiney, rough, sticky or downy? Are they arranged opposite or alternate?
2. With a hand lens, examine the scars where last year's leaf grew. Can you see the scars of the vascular bundles? Sketch the leaf scar.
3. Are the terminal buds any different in appearance from the lateral buds?

VII. Height of the tree

1. Find the height of the tree as follows:

On a bright, sunny day drive a 3 1/2 ft. stake into the ground so that exactly 3 ft. is sticking out. Measure the length of the shadow cast by the stick. At the same time, measure the length of the shadow cast by the tree (from base to very top branches). Figure the height of the tree using the ratio: $\frac{\text{shadow of stake} : \text{height of stake}}{\text{shadow of tree} : \text{height of tree (x)}}$. What is the height of the tree as you calculated it?

RELATED ACTIVITIES:

Use this same procedure for other types of trees.

TITLE: Environmental Awareness Inventory

LEVEL: High School

OBJECTIVE:

Students will gain more knowledge about their environment.

MATERIALS:

handout for each student

DESCRIPTION:

How many of the words and phrases below can you identify with:
A. short sentences,

for students

1. 5000 acres per day
2. 40 acres per mile
3. 570 lbs. per year
4. 6 lbs. per day
5. 200 gallons per day
6. 4 to 7 minutes
7. 6% but 50%
8. ecology
9. environment
10. acre
11. pollution
12. ecopornography
13. 6 X as great today as in 1900
14. 1000 spills every year

answers for instructor

1. loss of land for urban development, freeways, shopping areas
2. land use for highway development - (40 acres for average interchange)
3. paper per person (10 years ago 450 lbs) "save lunch bags"
4. solid waste per person
5. water consumption per person
6. lack of oxygen leads to brain damage
7. 6% population use 50% of goods and services (resources)
8. inter relationship
9. surroundings
10. football field
11. misplaced energy
12. garbage, junk yards, dumps, smog
13. water pollution
14. oil

Environmental Awareness Inventory (Continued)

- | | |
|-------------------------------------|---------------------------|
| 15. costs \$309 per year per family | 15. dirty air |
| 16. changes climate | 16. pollution |
| 17. #1 E. Q. problem | 17. air pollution |
| 18. E. Q. | 18. environmental quality |

TITLE: Ferns--A Flowerless Plant Study

LEVEL: High School

OBJECTIVE:

After studies of a thriving fern community, the students will be able to relate information on the life cycle of the fern.

MATERIALS:

hand lens

DESCRIPTION:

Observe the fern fronds - separate: simple, compound fronds undivided, lobed, separate leaflets

Make a sketch of the venation pattern

Observe the fruit forms from various types

1. spore-cases: distinct from green leaf
2. spore-cases: borne on the green leaf
fertile leaflets smaller than sterile leaflets
3. spore-cases: borne on a green leaf
fertile and sterile leaflets same size

Examine the rootstock: this is a stem rather than a root. It is evidence of the dead past. Study carefully and note following:

1. evidence of withered fronds
2. Do they join the rootstock?
3. Are the green fronds the same as the withered fronds on the rootstock?
How different?
4. Can you identify a growing tip of the rootstock? How does it compare with the total rootstock?
5. Look carefully for the frond traces of the past year only. How do they compare with the traces of previous years?
6. What portion of the rootstock is alive? What portion is dead?
7. Can you find the true roots of the fern?

Ferns--A Flowerless Plant Study (Continued)

Carefully examine the stipe-rachis.

1. Is it smooth or rough?
2. Are there scales present? If so, what color? What would their function be?
3. Is there a scale-bud relationship?

Carefully examine each frond of a clump. Do the fronds have the same number of pinnae on each side?

1. Make a sketch of the shape, edges and veins.
2. Do the fronds have fruiting pinnae?
3. Locate as many different species as you can and make notes on the habitat of each.
4. What environmental conditions do all ferns share?
5. Do you ever find ferns in sunny places? Why?

TITLE: Snow as an Accumulator of Pollutants

LEVEL: High School

OBJECTIVE:

To determine the comparative, relative amounts of sulfates and chlorides in our atmosphere and how these pollutants affect vegetation.

MATERIALS:

snow from various places such as cities, villages, hills, valleys, parking lots, driveways

DESCRIPTION:

Divide the students into groups of two and have half of the groups do the following with the snow:

1. Collect 5 liters of snow and melt. Filter, dry, weigh to determine particulate matter (soot, fly ash, etc.). Save the filtrate.
2. Boil the remaining filtrate until a volume of 20 ml remain. Divide this into 10 ml parts.
3. In order to determine the mass of sulfate materials resulting from pollution, complete the following:
 - a. Add 10 ml of INaCl_2 to 10 ml from step 1.
 - b. Weigh a piece of filter and record the mass.
 - c. Using the same piece of filter paper, filter the residue, if any, from step 2. Wash in 5 ml distilled water.
 - d. Dry filter paper and residue at 100°C .
 - e. Determine mass of filter paper and residue when cool.
 - f. Subtract the mass of filter paper (3b) from the mass of dried filter paper and residue (3d) in order to obtain the mass of sulfate materials found in 2.5 liters of snow.
4. In order to determine the mass of chloride materials resulting from pollution, complete the following:
 - a. We hope you have saved the other 10 ml of filtrate from step 2 as it is now necessary to add 1.0 ml of INAgNO_3 to this filtrate.

Snow as an Accumulator of Pollutants (Continued)

- b. Continue this portion of the investigation as you did with steps 3b, c, d, e, and f, but finding this time the mass of chloride materials found in 2.5 liters of snow.

Have the other half of the class in groups of 2 go with the snow collectors and sample the lichens and mosses as follows: estimate the moss and lichen cover on trees of the same species and correlate differences with forms of pollution. Estimates can be made using a square frame made of cardboard divided by strings into one-centimeter squares. The cardboard can conform to the tree shape and the smaller squares aid in estimation of cover. Sample 5 trees at each snow collection site on the east side of the tree 4 feet above ground level.

RELATED ACTIVITIES:

Compare the amounts of various pollutants found in a city or village with those of less populated areas.

TITLE: Water Quality Test
(Coliform Bacteria, Microbiology Lab)

LEVEL: High School

OBJECTIVE:

To check for the presence of coliform bacteria in a sample of pond water using standard procedures of the Health Department. Presence of E. Coli may indicate the presence of fecal contamination and therefore the presence of pathogenic bacteria.

MATERIALS:

petri dishes with agar
test tubes
Durham (fermentation) tubes = small test tube (1 1/2" to 2" long)
Can be made by heating a short piece of glass tubing, pulling it apart, and tapping one end shut.
incubator
graph paper
suspected water sample
E.M.B. (eosin, methylene blue) agar

DESCRIPTION:

Lab will take a period of about one week due to incubation time. Slack time can be taken up with background material on microbiology, bacteria and coliform specifically.

Monday

1. Each team of six students obtains two plastic petri dishes and labels them with their name, hour, date and amount of H₂O sample.
2. Accurately measure out 1 ml of pond H₂O using pipette or graduated cylinder. Place in petri dish labeled 1 ml. Spread pond water evenly over surface of agar by agitating dish gently. CAUTION: Lift cover as little as possible to avoid contamination.
3. Tape the top and bottom of the petri dish together (prevents accidents).
4. Prepare a second petri dish with 2 ml of H₂O samples. Tape shut and label. Place both dishes in incubator for 24 hours (be sure H₂O sample is in contact with the agar)

Water Quality Test (Continued)

Tuesday

Procedure A (Plate Count)

1. Count the number of bacteria colonies found on the agar plates without removing the top of the dish. Record in the table. Directions for counting are as follows:

- a. Select four squares at random on the graph paper. Count the number of bacteria colonies in each square and place the number in the spaces. Each square on the paper equals one square cm.

Square 1. _____
Square 2. _____
Square 3. _____
Square 4. _____
TOTAL: _____

- b. To find the average number of colonies per square cm divide the total by four.
- c. Find the area of the petri dish in square cm (πR^2).
- d. Multiply the average number of bacteria colonies per square cm by the number of cm in the entire plate. This is the total number of colonies found on the entire plate. Show your work.

DATA TABLE

Number of Bacteria Colonies Observed			
Incubation Time	Plate with agar and 1 ml sample	2 ml sample	agar only
24 hours			
48 hours			

1. Why would you expect to find a difference in the number of colonies found in 1ml and 2 ml H₂O samples?
2. What is the reason for the dish which contains only agar?
3. If you find bacteria colonies in the dish which contains only agar, where did they come from?
4. How can you tell that the bacteria colonies which you found in the dish with pond water came from the water and not from the air?

Procedure B (Each Team Prepare 2 Fermentation Tubes)

1. Pour 20 ml of lactose broth into each test tube. Pour some of the broth into the Durham tube first. Place the gas collecting tube (Durham Tube) inside the test tube, so that no air is present inside the gas tube.

Water Quality Test (Continued)

2. Label each test tube with name and hour.
3. Form a small cotton plug for the test tubes.
4. Place them in the pressure cooker for sterilization.
5. Wash all dirty equipment when finished.

Wednesday

Purpose: To count the number of bacteria colonies present after 48 hours of incubation on the petri plates. Record in data table. Inoculate sterilized lactose broth with water sample to check for gas formation which indicates the presence of E. Coli.

Procedure:

1. Keep the cotton plug on the test tubes at all times to prevent contamination.
2. Using a pipette, add 10 ml water sample to the fermentation tubes. Remove cotton and replace it quickly without putting it down.
3. Mix gently by rolling the test tube in the palms of your hands.
4. Add the date and amount of sample to the label of each tube.
5. Place the test tubes in the incubator for 24-48 hours.

Questions:

1. What is fermentation? Explain how it is different from respiration.
2. Write a general equation to show what happens during fermentation.
3. What are the end products of fermentation by yeast? By bacteria?
4. Lactose is a complex sugar made of _____ & _____.
5. In order to release energy from sugar molecules during fermentation, what special chemicals are required?
6. Why is lactose broth used to specifically test for E. Coli.?

Water Quality Test (Continued)

Thursday

Procedure A

1. Check fermentation tubes for gas bubbles which indicate the presence of coliform bacteria. Record in the table below.

Incubation Time	Tube with 10 ml Water	Tube with No Water
24 hours		
48 hours		

2. What is the tube with no water for?

Summary

From this lab work, explain what you have learned about the water quality of pond water.

Coliform - The Confirmed Test

1. Why was the presumptive test with lactose broth insufficient to prove the presence of E. Coli?

In order to be positive E. Coli is in your water sample, you have to streak a plate of E.M.B. Agar.

2. What is E.M.B. Agar?
3. Describe the process of streaking.

fire equipment to sterilizer--glass rod with a wire inserted--wire has a loop on the end--dip into tubes of positive presumptive test samples--streak plates in a squiggly cross (spreads out the colonies); re-sterilize the equipment; label E.M.B. plates and incubator

4. What would a typical E. Coli. colony look like? (metallic green color with small black dots in the center)

Incubate your plates for 24 hours.

5. Is the test positive or negative for E. Coli.? Describe and sketch any colony growth.
6. What can you say about the quality of your water sample?

TITLE: Haiku (Creative Writing)

LEVEL: High School

OBJECTIVE:

To make the students aware of their immediate surroundings.

MATERIALS:

pencil

DESCRIPTION:

These mini-exercises should be assigned while on a field trip to a quiet place. A choice of 1 or more exercises should be mandatory (giving lee-way to individual differences).

I. Haiku Poetry

Due to the form and content of Haiku (pronounced: high-ah-koo) poetry, it is in direct correspondence with nature. Haiku is Japanese poetry, however it is a unique and versatile art form in any language. The Japanese have strict rules about writing Haiku:

1. The poem must refer to nature.
2. It must represent or have reference to a season.
3. It has only three lines.
4. The first and last lines have 5 syllables and the middle has 7, for a total of seventeen syllables.

For this exercise, the student may try for a true Haiku by following the above rules, or he may try for a Haiku effect or image. Encourage them to be creative and original. Emphasize the idea that they are a part of nature, they are in nature, and all they have to do is to describe the natural feeling they have. Forget rhyme and meter. Examples:

1. Flowers on a stem
Do not always blossom full
But thought never dies
2. I'm a new born tree
My life has hardly begun,
I hope it will last.
3. I am nobody
A red sinking autumn sun
Took my name away

Some students will find it difficult to conform to the Japanese rules of Haiku, consequently they should try for a Haiku image which reflects their feel-

Haiku (Creative Writing)--Continued

ings about nature or life in general. Ask them to keep the Haiku form of three lines.

For all of the students, tell them not to begin writing immediately. Give themselves time to become aware of their surroundings and the effect these surroundings have on them. When they become aware of these things, write about it.

It will help the instructor as well as the students to have a prepared sheet giving the rules of Haiku.

1. Refer to nature
2. Describe or refer to a season
3. Have only 3 lines
4. Line one = five syllables
Line two = seven syllables
Line three = five syllables
5. Forget rhyme and meter
6. Relax and be natural

II. Cinquain Poetry

Cinquain poetry is a French form of writing. It is pronounced SIN-CAN. The literal translation is "five lines". With exposure to the form and technique of Cinquain poetry, the student will find a simple, yet expressive outlet for writing nature poetry. It's form is as follows:

1. Line one = word, noun, topic of poem
2. Line two = 2 words, adjective, description of line 1
3. Line three = 3 words, action phrase, describes action of line 1
4. Line four = 4 words, personal phrase, poet's feeling on line 1
5. Line five = 1 word, noun, renames line 1

The teacher should enthusiastically encourage the students and emphasize the ease of writing Cinquain. Here are some examples:

1. Sunset
Bright, colorful
Singing into night
Makes me feel Happy
Dusk
2. Bob
Strong, happy
Thinking about tomorrow
Helps me enjoy life
Friend

The student should be provided with the format and the examples. Write your own Cinquain below:

1. _____
2. _____
3. _____
4. _____
5. _____

III. Situational stimuli

Many times creative thought is blocked out by a lack of sensitivity to ones surroundings. To increase one's sensitivity is to inspire creative thinking. Have the students find a quiet place to sit. Ask them to use their imagination to visualize the area as a setting of a short story. Another variation, is to describe the area as it might be written in a tour guide.

TITLE: Living Things Prove Their Value

LEVEL: High School

OBJECTIVE:

To demonstrate the value of a variety of living things.

MATERIALS:

area for a hike (school lawn can be used)

DESCRIPTION:

On the field trip, start with the simplest form of life including both plants and animals. At random a plant or animal is pointed out and the class is told to write down all the things that form of life is noted for. All values are brought out concerning the plant or animal. The field trip will show the students the value of all living things around them and help them appreciate nature.

RELATED ACTIVITIES:

Consider the natural enemies as a means of population control.

Discuss the protective characteristics of plants and animals for preservation.

Discuss the importance of a balance in nature and how man may upset this balance.



TITLE: Wind-Chill Factor Determination

LEVEL: High School

OBJECTIVE:

To determine the effect of wind on the body surface.

MATERIALS:

chart

DESCRIPTION:

The skin is one of the chief agents for regulating the body temperature. Excess body heat is given off by radiation. Our sweat glands moisten the skin surface and breezes evaporate the sweat, cooling the body. When more wind dries the sweat as rapidly as it comes to the surface, we no longer are aware of sweat, but we are still losing body moisture. If 10% body moisture is lost, the results are fatal. The more skin exposed to wind, the quicker we succumb. Actual chilling can occur at a normally comfortable temperature if there is a moderate wind. The skin surface may get down to the freezing point of water. One result is that surface blood vessels shut down, the skin turns white and blood distribution in the body becomes unbalanced. Strong steady winds that you may easily encounter in mountains or at the beach can produce dramatic losses of body heat that may be damaging to the body.

By checking the charts on wind velocity and air temperature, one can see the need for proper clothing.

Wind Velocity

Indications

0-1 mph	calm: smoke rises vertically
1-3 mph	smoke shows wind direction
4-7 mph	wind felt on face; grass or leaves rustle; snow eddies
8-12 mph	leaves and small twigs in motion; light flag extended by breeze
13-18 mph	dust, snow or leaves are raised; branches move
19-24 mph	small trees in leaf will sway; crested waves form on inland water
25-31 mph	large branches in motion; white caps on waves; tents billow and strain

Wind-Chill Factor Determination (Continued)

Wind Velocity

Indications

32-38 mph

whole trees in motion; walking against wind difficult

39-45 mph

twigs break off trees; walking generally difficult

46-54 mph

branches break off

To determine chill factor: estimate wind velocity in miles per hour from table or other weather data. Read temperature from thermometer or get the lowest temperature forecast for the area. In following chart where columns intersect is the value that will indicate the effective equivalent temperature at zero miles per hour.

Estimated Wind Speed in MPH	Actual Temperature (°F)									
	50	40	30	20	10	0	-10	-20	-30	-40
Calm	50	40	30	20	10	0	-10	-20	-30	-40
5	48	37	27	16	6	-5	-15	-26	-36	-47
10	40	28	16	4	-9	-21	-33	-46	-58	-70
15	36	22	9	-5	-18	-32	-45	-58	-72	-85
20	32	18	4	-10	-25	-39	-53	-67	-82	-96
25	30	16	0	-15	-29	-44	-59	-74	-88	-104
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116

TITLE: Match Experiment

LEVEL: High School

OBJECTIVE:

The students will observe the environmental changes in micro-climate.

MATERIALS:

kitchen matches
clay

DESCRIPTION:

Strike a match and stand it in clay. Allow it to burn as long as possible.

- A. As the match burned, what changes, if any, did it produce in the surroundings?
- B. Did any of the changes you observed affect you in any way?
- C. What evidence do you have that chemical changes were taking place as the match burned?
- D. Recall the procedure you used when lighting the match. What did you have to do?
- E. What form of energy is associated with friction?
- F. What products resulted from the burning of the match?
- G. When hydrogen combines with oxygen, what product is formed?
- H. A very important product of the burning match is energy. What forms of energy did you observe during the burning?
- I. What is the input to the match from the air?
- J. Do you, at this moment, have any influence on the surroundings?
- K. What is being exchanged between you and the air?
- L. If everyone in the room struck a match at the same time, would the heat, smoke and odor produce a change in the room?

Match Experiment (Continued)

- M. List the materials each of the following organisms must take from its surroundings in order to survive?

____ Corn Plant ____ Rat ____ Bug ____ Fox

- N. What output products would you predict for each living organism.

____ Corn Plant ____ Rat ____ Bug ____ Fox

- O. What influence do these same organisms have on each other?

- P. During photosynthesis, the output of green plants increases the amount of what gas in the surroundings?

- Q. During photosynthesis, the intake of green plants decreases the amount of what gas in the surroundings air?

- R. Indicate the input-output gasses exchanged between green plants, animals and the atmosphere.

- S. What would happen to the surrounding atmosphere if all green plants were suddenly destroyed?

- T. What would happen to the surrounding atmosphere if the number of animals needing oxygen were suddenly increased greatly?

- U. What output of animals can be of benefit to green plants?

- V. What do you predict would happen if all plant consumers in an area were suddenly killed?

- W. What do predict would happen if a catastrophe destroyed the decomposers in a given area?

- X. What would be the effect in a given area, of a sudden increase in animals which consumed other animals?